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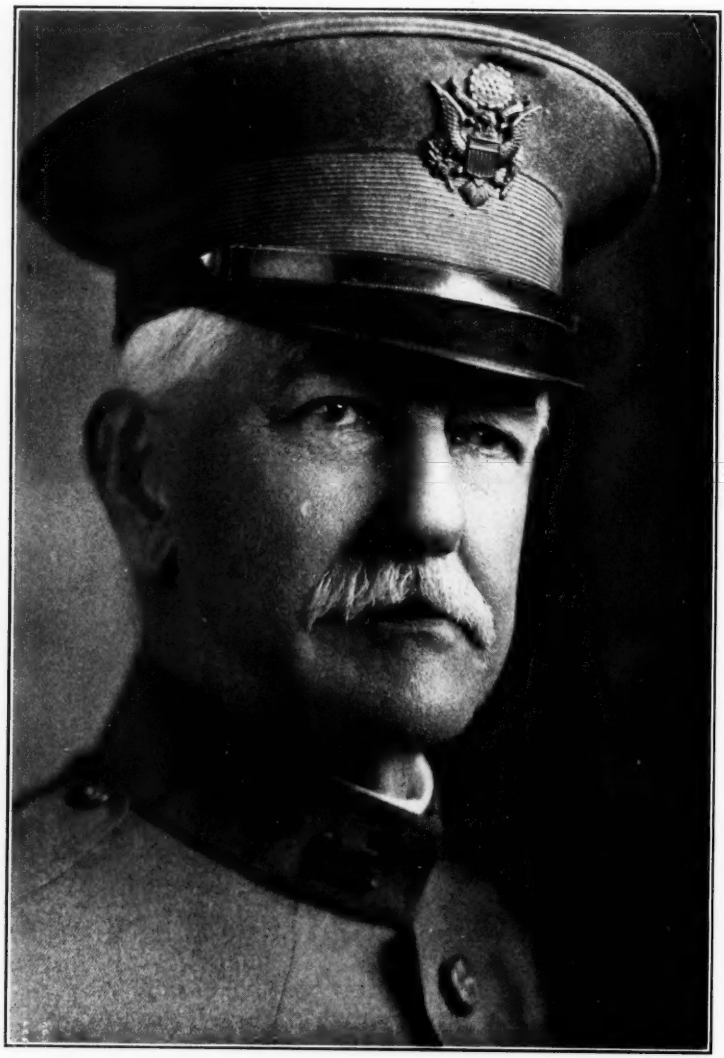

MAJOR-GENERAL WILLIAM C. GORGAS, SURGEON-GENERAL U. S. ARMY.

THE JOURNAL
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Original Communications.

THE CLINICAL STATUS OF THE GINGIVO-PERIDENTAL AND DENTO-ALVEOLAR INFECTIVE FOCAL PORTALS.

By Clarence J. Grieves, D. D. S., Baltimore, Md.

(Read before the Georgia State Dental Society, June 12th, 1918.)

IT SEEMS almost incredible that during nearly ten years clinical study frequently confirmed by laboratory data, some definite understanding between medical and oral diagnosticians cannot be had as to whether, after the usual attention by the average dental practitioner, there still remains in and about the teeth infection sufficient to induce a focal area, with eventual serious consequences to the entire body. It is odd that we hear of no such disagreement between other surgeon specialists, whose business it is to eliminate foci; the laryngologist, gynaecologist, urologist, and general surgeon appear to have no trouble in satisfying the internist of their knowledge of the presence of diseases which they treat nor, except in extraordinary cases, of their ability to remove all of the diseased tissue.

Why then all of this continued disturbance about the mouth and teeth? Is mouth disease more elusive in its etiology and pathology than that of other organs, or is it just more difficult to treat, retaining the functional organs? Can the general medical practitioner make a dental diagnosis, finding evidences of disease after the dentist has done his best both in diagnosis and treatment or what is the defect, if any, in oral pathology?

Thruout this long period the internist and specialists have proceeded with radiographic reviews of mouths of patients who are under our constant care. When the physical diagnosis was in the least

doubt, they have, with or without help, generally from some brother dentist obtained an adverse interpretation, thereby condemning to the forceps tens of thousands of teeth which we allowed patients to retain as normal; further, these teeth were removed, very obviously; not by the physician, but by still another dentist, who, even if he sacrificed a few functioning organs, at the order of the medical man, and against his better judgment, committed a crime against the laity and was treasonable to his profession. Quite frequently the patient is returned to his own dentist for review by the physician who if the patient fails to recover, finds, on a second radiographic survey infected teeth still remaining, in which event the doctor is certainly blameless for radical procedure. In the meantime the public, in whose interests laws were enacted giving absolute domain to each of these practitioners in their respective fields, is the patient and the sufferer; with expression and speech marred, occlusion often ruined and thus nutrition impaired, the public is told to go back to the dentist and have it all repaired; very evidently, if the physician has little respect for the dentist's feelings or his pathology, he has the greatest faith in, and admiration for, his prosthetic abilities; for when possible, every tooth ordered out by the physician must be replaced, often at no end of annoyance, by the dentist.

On the other hand, the responsibility of the medical man is great; in the light of modern medicine, common sense and cleanliness; he must allow no infection to persist in or under the patient's epithelial protective coverings, regardless of his supposed state, sick or well. In matters of health his mandate is absolute; if he says operate, we, just as all good surgeons, giving the whole body rather than the organ the benefit of the doubt, should operate, if our joint opinions can be confirmed by post-operative findings or surgical pathology; if sure of our pathology, we may refuse, assuming not only the responsibility of the patient's denture; but of his health as well, and remembering that here too results may be checked up by conservative clinical diagnosis, pathology and bacteriology. This is indeed a grave situation, and who shall settle it, as the court of the last resort? There can be but one answer, it will be, more than that, we believe has been, finally settled in the laboratories of unprejudiced pathologist and bacteriologists whose opinion is final in all similar disputes, concerning even more vital organs.

We must think shrewdly on this question, the whole matter is one of pathology, "the sum of the knowledge of Disease." It is distinctly not a discussion of what is best in armamentaria or materia medica, for the treatment of cemental or gingival and dentinal or pulpal lesions; the sterilization of tooth apices or filling of root canals, except as contributary therapeuses or surgery to the care of these lesions. After the application of all that is best in these methods, does infection still exist in and about the teeth, that is the vital question? If still diseased, why does not the dentist know it? And if he knows it, why will he persist in retaining such teeth? That is still another question, which suggests something radically wrong in our pathological instruction. We believe this indeed to be the key to the problem; think of the growing interest in pathology since focal areas were first associated with our work and what a dignifying influence it has had upon the profession. Recall your instruction in the narrow general and dental pathology of the period, much of it wrong in principle and application. In the past, whatever the etiology of dental caries, we were satisfied if a vital tooth could be immediately filled with no pain nor recurrence of decay and if the pulp was involved, when it could be removed and replaced by canal fillings, with no after pain nor

pus, we were content. Gingival lesions, pyorrhea alveolaris; the result of "The judgment of God, or some ill humor of the blood," gave no pain and were diagnosed by pus flow; if pus was present, flowing from a fistula, it was alveolar abscess; if from the gingivae, pyorrhea. How astonishingly simple! In the writer's experience of thirty years, no conscientious dentist has allowed pus to persist in the mouth, so our error was one of omission in training rather than of commission or neglect. Recall, if you can, the consternation amongst us when accurate radiographs, backed later by clinical findings, exposed the delusion; we had not cured alveolar abscess nor pyorrhea; we had not removed all of the pulp nor filled root canals, but often had ruined many vital teeth to crown and bridge. Bacteriologic laboratory tests were disheartening, showing that by the use of strong germicides we had not, as we thought, sterilized roots, but had induced the very thing we were endeavoring to cure, adjacent periapical infection; nor was a common carious cavity non-pathogenic, because excavated and filled ever so quickly.

There could be no better illustration of the folly of teaching an isolated and misleading special dental pathology than this unfortunate predicament of an entire profession; but now since we have paid the price of partial training, we must profit by the experience. Let it be said once, and for all time that there can be no separate dental pathology, any more than a liver nor a joint pathology, governed by other than standard axioms of general pathology; so soon as the dentists' instrument passes thru the epithelial protection, sometimes even before, into cell lymph spaces or by the dento-enamel junction, into the granular layer of Tome, he is in slow but sure absorptive contact with the blood stream and all that is known of prevention of local and general disease, must then be applied, if he is to preserve the local organ and incidentally the health of the patient.

So in writing or speaking of disease, it must be in the language of the pathologist, if we expect our medical friends of the laboratories to understand and not to smile at our ignorance. The use of such terms as "pathological tissue," "inflamed," "irritated," "diseased gums," "dead teeth," "blind abscess," "infected pus," etc., are just as annoying to a pathologist, looking for terminology conveying information, as are his expressions, "toothache," "dental nerve," "ulcerated root," to us and it is useless to make a scientific mouth diagnosis and operation, which may relieve the patient of some serious ill, if we cannot report our post-operative findings in the language common to surgical pathology; for that report explains and justifies the operation. In illustration, we must at least recognize other types of inflammatory exudates beside the purulent or suppurative pus form, with its characteristic polymorphoneuclear leucocyte content, such as the serous and fibrinous, hemorrhagic and catarrhal; each distinct in cell reation and detrital element; the common use of the terms croupous, diptheroid and diptheritic denoting the varying amounts of tissue necrosis, and many such expressions, usual to any pathological laboratory or text book, must be known if we are to be alert consultants. Again, according to the quantity and quality of invading agent, there may occur quite in contrast to tissue liquefaction, a constructive or proliferative type accompanied by little or no pain with many lymphocytes, endothelial leucocytes plasma cells and fibroblasts, existing as open granulation necroses, granulomata; cysts, etc., or any and all of these may be combined with liquefaction. These various types have been admirably amplified and applied from the dental standpoint by Thoma. Such conditions must be approximately diagnosed before treatment begins, be-

cause the response of a particular type dictates the treatment; for instance, no surgeon would attempt to drain an apical granuloma thru a root canal, when there was no exudate to drain, nor would he continue forcing coagulating germicides or strong caustics up its lumen, and not expect a tissue necrosis, soon to be reinfected; that he would attempt sterilization by ionic medication by the hour is unlikely, if he was shown that sufficient current to be germicidal, would destroy normal bone cells in situ. By sterilizing the source and filling the foramina, no matter how effectually, he would not expect this infected mass of persistent granulations lying in bone beyond the tooth to be absorbed, short of removal, thoro currettage, often drainage, and yet, judging from our literature, many such methods are popular among dentists. In gingival invasion which had become chronically interstitial, he would not continue irrigation, medication by strong germicides and acids, or vaccines, when he knew, even in the absence of calcic deposits, that necrotic infected cemental surfaces were to be planed and many granulations to be curretted from attaching tissues. This is only elementary surgical pathology; it is more than likely an intelligent combined bacteriologic and pathologic report by the exodontists and oral surgeons, who perform the "post dentem," if you allow the word, would settle this still doubtful question of focal dental areas in the time consumed in its presentation.

We all agree that accurate intra-oral radiographs, with not more than two teeth in focus at any time, and occasionally extra oral plates, made by an operator who knows dental anatomy, are very necessary to correct diagnosis of damage to adjacent dental tissues, as well as calcific pulpal changes; fillings and dressings approaching the pulp; correct or incorrect root canal work, etc. We are also aware of many defects, they will not show. *We distinctly do not agree even in the dental profession, on the interpretation of these radiographs* and are justly provoked when any one, unfamiliar with oral anatomy, reads into a radiograph what is not there, especially in criticism of painstaking work; a medical man or radiographer has no more right to interpret a dental radiograph, ordering a dental operation than has the dentist, a right to order major surgery, as of the upper right quadrant, for instance, from a radiograph, he may have made, for, under the law, the physician is then practicing dentistry and the dentist surgery.

It is annoying that the professional radiographer will never learn oral anatomy; he makes a report on the base of the brain and the paranasals, upon the strength of which the laryngologist or brain surgeon may, if the clinical facts agree, operate; but you cannot trust his findings as to teeth. For instance, the appearance of the mental foramina approaching the inferior bicuspids apices, is invariably interpreted as infective erosion or rarefaction, as are the incisive foramina about the superior central incisors; the eruptive tooth crypts of superior laterals, which often persist with open trabeculae, as well as those in which the second and third mandibular molar apices appear to lie, when in infra occlusion or partially erupted, are often reported as rarefactions; thereby many such valuable normal teeth have been lost; occasional radiolucent variations, in the maxillary and mandibular medulla, approaching filled or crowned teeth are said to be infected, with no regard to the patient's age nor comparative study of other cancellations in the same jaw and this is particularly true of any unusual dip of the antral floor, in its relation to filled roots of superior bicuspids and molars. With no attempt to belittle the radiograph, for without it, as an adjunct, we would be lost indeed, it is possible we have taken the radiographer a little too seriously; he reports

on every organ and bone in the body, besides the teeth; it is likely that he knows as little about the symptoms and the operation to correct a stricture of the ureter or a tuberculous joint, as he does about treatment of diseased teeth and dental treatment; yet the surgeon and orthopedist accept his report as interesting, and if it coincide with the clinical findings, they regard it as a valuable adjunct; but they do not swear at him, even if he orders out a kidney or off a leg. The radiograph amounts to little, without your finger on the tissue and your judgment as a trained dental specialist in your mind's eye. There are, however, several fixed diagnostic landmarks, dependable in interpretation, and principle among these stands the character and stability of that hard lining of each alveolar socket, known as the stratum durum or lamina dura; (Hopewell Smith) showing as a dense line surrounding each tooth uniting with its neighbor to form the interseptal alveolar crest, it defines, circumferentially, the the normal width of the peridental membrane. Its disappearance, together with supporting trabeculae in the gingival third, marks the deepening gingivitis; in the middle third, the extent of alveolar resorption to great stress, as in loose bridge abutments, or infection, in deeper gingival lesions; all this of course subject to the dental clinical findings. Its disappearance in areas, particularly in the middle and apical third, with thickening of the dark line representing the peridental membrane, indicates undue stress or a proliferating peridontitis; it may be completely fused in this region by normal cemental repair or the hyperplasia may progress to a hypercementosis, it is missing in cemental hypoplasia and denudation or when the peridental membrane is destroyed in the midst of suppuration, unorganized bone granulations, granulomata or radicular cysts. When roots approach the maxillary sinus, it always normally appears in the floor, usually crossing the dense antral linings. So, lack of continuity in the lamina dura is undoubtedly a most valuable symptom of infection, advancing beyond the confines of the tooth, and clinically, if it be intact, the cementum should be considered healthy. Variation of the lamina about any, and particularly, a pulpless tooth, condemns it to exploration by all tests for normality, i. e., sensitiveness, of more than one dentin area; response to thermal change, the Faradic current, percussion and palpation and continued radiographic survey.* Beside the easily diagnosed various exudative types, venting on the surface, the radiograph indicates a condensing osteitis; the crypt wall containing granulomata, showing as dense as the lamina, and on enucleation disclosing a crypt lining, as smooth and hard as cortical bone, in the midst of the cancellated medulla.†

In long standing rarefactions, or often in shorter periods with bacteria of greater virulence or adaptation, this crypt if carefully explored, will be found broken down at points, possibly via the many afferent sac vessels, producing a secondary invasion of the medulla, without demarkation. Depending on the infective period, the granuloma often degenerates into a radicular cyst, with further invasion of the cancellation; or there is a large ill defined area of doubtful radiolucence filled with unorganized infected granulations. Absence of rarefaction is not always evidence of the

*It is a grave mistake to open and attempt to refill any pulpless tooth where radiograph shows root fillings even to the middle third with complete lamina and no rarefaction; for invariably virulent re-infection arises; such teeth should be kept under survey.

As confirmatory of such practice might be mentioned the fact developed in war surgery where previously operated and healed bone areas, on second operation occurring in a month or two, break down making poor recovery. Cultural tests growing positively from bone scar in such cases the later operations are delayed for a year.

†Under these conditions it is not unusual for the peridental membrane of the molar and bicuspid groups under bite stress to compensate in the middle and gingival thirds, fusing the lamina, and almost approaching synostosis, while the apex lies unsupported in granulations.

normal, for degenerative changes may occur in long standing areas, with calcification, hyalin, cholestrin or sclerosis and much infection, which are not always radiolucent. It must never be forgotten that radiography is all relative, the adjacent tooth tissue contrasting only where radiolucent; a central, for instance, masks all the medulla paralleled by its root, labially and lingually, and exposures from varying angles distort without helping the perspective, thus unquestionably many infective areas are overlooked. Tortuous fistulae and sinuses are also masked by interposition of dense bone as in gingival invasion of impacts where the whole crypt may be involved and must be confirmed by dental exploration. As a safe interpretative guide, it is nearly always possible to find some older post-operative area of repair, for comparison with the point under discussion; new cancellations should usually, depending on time and radiolucence, appear as that area. Good radiographs are rarely misleading, and it is the writer's experience *that post-operative results are always more pronounced than the X-ray would indicate;* but it is likewise true that radiographic possibilities are limited, the factor finally determining normality of oral tissues being the dentist's clinical conclusions and his attitude in interpretation, for obviously the medical man, sadly lacking dental education, cannot give a true interpretation, much as he presumes to do so. Can teeth, where the clinical findings are confirmed by the X-ray as abnormal, when compared with others in the same mouth, be treated and retained, or should they be removed? As to the gingival, so-called pyorrhea infections, it is the writer's observation, if the traumatic factor can be corrected, even in malocclusion, ninety per cent of the cases may be cured, if preceding lacunar or perforating canal absorption has not undermined the tooth, so as to allow definite sway; provided always, the dental operator will develop the fine technic of the periodontic specialist (who does a delicate clean blood clot operation) and will give the case the attention and time consumed by these specialists, whose services to the profession have been invaluable. The ten per cent incurables include, leuetics, diabetics, sugar over 4%; certain stages of chronic nephritis, difficult to determine as are those of arterio-sclerosis and also a group of obscure, possible gastro-intestinal toxemias; these patients should be kept under the strictest survey or cleared up at once by the exo- and prostho-dontists.

By a cure is meant such improvement in stability of each tooth, due to formation of good fibrous tissue, if not alveolar bone, as to permit usual occlusal stress without a retainer; the relining of pockets by normal epithelium and positively no exudate of any sort flowing from the gingival trough. After a long experience in stabilization of teeth, the attaching tissues of which are lost sufficiently to depend upon constant treatment and a splint, the writer is convinced that all retention is pernicious practice, for some root, in the midst of the appliance, invariably becomes reinfected with no warning to the patient, whose jaws and health may be as much damaged as the reputation of the dentist who constructed the stabilizer. The same rule often applies to bridges fixed and removable, it requires the keenest judgment to decide in such cases whether replacement shall be by dentures or bridges. Without elaborating on the voluminous literature of progressive gingival infection several clinical facts are outstanding; the danger of invasion, local and general, is out of all proportion to tissue liquefaction; there may be much pus with little damage to the septal crests and the patient or the reverse, with only a slight serous or fibrinous exudate, the teeth all firm, but the pockets quite septic; again, lacunar or perforating canal absorption may have dis-

solved progressively the whole alveolus, often poorly shown in radiographs because the calcic detritus still remains, the teeth swaying in masses of infected fibroses and granulations, yet little exudate: or the teeth may be still firm, with bone loss to the apical third. It would appear that Hartzell and Henrici are right in concluding, that whatever the predominating micro-organism in the exudate, which is generally staphylococcus; deep in the tissue, some streptococcal form is usually found; occurring under a tooth which sags with each occlusal stress, these forms often of great adaptability or virulence, are pumped into the local tissue lymph areas with each mandibular movement, hence, in the writer's opinion, there can be no greater menace to the surrounding teeth and the patient's health than swaying pyorrhea teeth and their continued retention under pretense of treatment, by a dentist lacking proper instruments and technic.

It is important, if we are to gain a correct conception of the infective pathway leading to periapical regions, that the septic element as associated with dental caries be considered. Without reviewing the literature, for clinical purposes it may be stated, with but one or two exceptions, all authorities agree, that pathogenic forms, associated symbiotically or otherwise, appear deep in the carious detritus. Streptococcus, pneumoccoccus, staphylococcus and a diplococcus, uncontaminated, have been grown from cuttings taken, far below the excavated carious zone, from supposedly sound dentin, such as any operator might think basally safe for filling emplacement, but it is a much more difficult laboratory problem to demonstrate microscopically such organisms in the tubuli. There is no proof that cavity preparation of vital dentin, while it may remove all caries, reaches this septic element, deep in the tubuli, the operator must therefore bear in mind, this dual character of dental caries; which is that of a chronic ulcer with tissue necrosis superficially and infective strains, at such depth in the matrix, as the hyalin appearing defense zone of calcoglobulin or the local resistance may permit. An attempt should be made to cleanse this operative field by sealing in every cavity in vital teeth, a noncoagulating agent, sufficient time for tubuli penetration, the writer for several years has used a 10% solution of beechwood creosote in oil of cloves, each remedy selected for penetrability of dentin, which while not ideal, gives some assurance that the final dentin cutting is in a sterile field with less risk of forcing infection into normal tubuli and prevention of sealing pathogenic bacteria under the filling. There can be little doubt that many pulps covered by dense dentin and fillings become the septic factor, particularly in young dentin as the first permanent molar, by neglect of such precaution, bacteria finally reaching the attaching tissues by way of the pulp lymph supply to produce periapical infection with no pain; radiographs displaying simultaneously dense dentin, between pulp and filling and apical rarefaction; the dentin sensitive in areas, the pulp hemorrhagic on exposure and apparently vital and responding more readily to heat than cold; this last symptom, a slight response to palpitation, and aspiration of rarefied areas, with subsequent cultures, are the only diagnostic factors in studying such cases, which are most deceptive and dangerous. There are many phases of pulp disease beside those said by text books to arise from "vascular hyperaemia and stasis" indicated by response to thermal change with inflammatory exudation producing pulpitis; plugging by infarct or thrombi the apical pulp vessels and resulting in

fatty, fibroid or gangrenous degeneration; that this classic picture, without the infective element, is far indeed from the real condition, the writer is assured from cultures and slides, which prove that pulpitis is produced, primarily, by dentinal infection, just as later the pulp passes on similar forms to periapical tissue. With the tooth as an ideal culture tube, and pulp as excellent media, under bite stress, if the root or careless dressings be open to it, is there any reason why pulpal and apical infection by injection should not follow? Three very important histologic factors necessary to this discussion are now called to your attention. *The first is the vitality and resistance offered to septic invasion by the granular layer of Tome;* this layer of interglobular spaces, filled with mucoid connective tissue; with plasma circulating to and from the pulp via the dental tubuli, you will recall, completely surrounds the dentin as its outer boundary, forming the junction between enamel, cementum and dentin. That this is the first vital area to be invaded by caries undermining enamel, all operators understand, but the *attendant penetrating infection too, must never be overlooked,* which is not only via the involved tubuli but via the granular layer as well, a flanking movement on the dental pulp, so to speak. This is true of the crown, but under the gingivae, where larger interglobular spaces are in much more open contact with cementum, and the mucoid content more vital, while there has been no proven communication thru the first cemental lamina, which is quite dense, the nearest vitals cells, the cementoblasts in the second lamina, suggest from the trend of canaliculi, which is only in the direction of pulp and peridental membrane, that some osmosis of tissue juices must exist from pulp to membrane, in fact any other condition is biologically inconceivable.* It may appear hypothetical to speak of a resistance to sepsis in the granular layer and dentinal tubuli, because no leucocyte is as small as the tubulus, assuming the bacteria to lie inaccessible in the dentin matrix; but chemotaxis is very active in all oral tissues for the ferments and antibodies of blood plasma as well as its cell content and plasma certainly circulates from the pulp to granular layer of Tome, even if the leucocyte cannot, so the writer is as much of a believer in such protection, as he is in dentin repair under a good filling or during abrasion. The commonly noted persistance of sensitiveness of root canal dentin after thoro pulp removal, suggests a cemental source of vitality, independent of the pulp; *if this be so, even for a period, it is most hopeful delaying complete dental infection until pulp removal and treatment can be instituted, thus preventing subsequent apical damage;* and it confirms the writer's idea that while infection progresses rapidly in the coronal dentin, covered by enamel, it is slower in the middle third root dentin, covered by vital cementum, and much slower in the vital periapical cementum.

The second histologic factor is the recent and clever demonstration by Noyes of a definite lymph supply, perivascular possibly, in the dental pulp; this completely upsets the older idea, which conveyed, contrary to all biology, a picture of an embryonal connective tissue, safe only so long as protected by dentin matrix, and unlikely as a septic portal, because isolated from the main lymph

*The following quotation from Tome is appended because while old as histology goes and considered visionary, this view has lately been adopted by many leading histologists.

"The human tooth is connected with the living organism very intimately, even tho its special tissues are extra-vascular. For blood vessels and nerves enter the tooth in abundance; the dentin is organically connected with the pulp by dentinal fibrils, these are connected with the soft cement corpuscles which again are brought by their processes into intimate relationship with similar bodies in the highly vascular periosteum. So that between pulp inside and periosteum outside, there is a continuous chain of living plasm."—Hopewell Smith, "Dental Anatomy and Physiology."

channels, but once invaded, with no reparative power. The later, more reasonable conception, is that of a tissue which is occasionally tho slightly infected and more capable of recovery; but when once thoroly involved, infinitely more dangerous, because in direct communication by reason of this lymph supply with adjacent tissues, and body generally, as illustrated before in case of apparently vital teeth with granulomata. The operative significance of these facts is obvious, they explain cocaine poisoning from pressure anesthesia, suggesting its danger in pulp removal by forcing bacteria along the same path. They show the importance of immediate pulp removal as soon as diagnosis will permit, avoiding apical infection and confirming the wisdom of the practice of infiltration or conductive anesthesia, in this operation; they explain unexpectedly rapid absorption of arsenic in pulp devitalization and penetration by high percentage formalin preparations, all producing periapical necrosis prior to complete pulp removal. *The sterilization of dentin and cementum without destruction of adjacent tistues is the profession's greatest problem, which when solved, will save countless teeth, but it has not been accomplished as yet, any more than bone sequestra have been sterilized in situ.* Without unnecessary detail, it may be said, with one or two exceptions, all the methods, including the latest ionic medication, are much too drastic and objectionable: to be effectively germicidal, the electric potential and dissociation, or coagulating and oxidizing elements in each, must be so high as to produce a secondary surrounding tissue necrosis, which usually becomes reinfected; a destruction of the reparative cells, but not the pathogenic element. Any histologist familiar with bone and dentin section technic and time consumed in tissue penetration and clearing, cannot but be amused by extravagant claims of instant penetration and sterilization of thick dentin and cementum, by wiping or flushing with alcohol, chloroform or combinations of hydrogen peroxid and bichlorid or by dessication, formalin in high percentage, pure phenol, cresol and zinc chlorid, all strong proteid coagulants, as shown by Hinman, are also used, hardening the tubuli contents, preventing further penetration, and sodium and potassium is much too effective, extending into and destroying the entire periapical region, as proved by Callahan's slides. Much more may be accomplished, by a better exposure of the field to be treated and greater dilutions as 4% Formalin or Aqueous Iodine, in devital; and 10% Cresol in Oil of Cloves, in vital dentin; sealed for a period by temporary cement to prevent salivary leakage and dilution. When, however, dentin is absolutely saturated with bacteria, from long pulpal or salivary exposure or is associated with granulating or liquefying periapical invasion, its complete sterilization is questionable. After the application of all sorts of germicides, the pulp canal may be proven sterile, but if after careful extracting technic, preventing contamination, a horizontal section of the root be split, as in apiectomy, and chippings be taken from the outer areas about the granular layer, positive cultures are almost certain.

This explains so many failures of well executed apiectomy, for a fresh cross section of dentin is thus exposed, as explained by Hinman, sterile about the canal but infected at the periphery, which amalgam encapsulation will not protect, without shelving into adjacent tissues, at first rapid bone repair may be apparent, but later radiographs, display the same old rarefaction; the postoperative area may be smaller; but nothing short of a lasting restoration of medulla with no subsequent rarefaction is acceptable, proving that surrounding tissues lie in physiologic contact with sterile dentin, cementum and filling; *this is axiomatic in all bone surgery, and there is no good reason why dentists should claim that persistant granu-*

lations lying in the jaws are not infectious and leave them there. The third histologic factor deals with the character of the apical cementum and attaching peridental membrane, this has been covered in another paper, to which you are referred; we really can never know enough of this region, for no tooth should be retained while it remains unrepaired; and upon its vitality depends the life of the tooth, often the health of the patient. Much more open in the lamellar structure than the other two-thirds, the apical cementum is also formed, according to age and use, like the bark of a tree; in youth, the first lamina is deposited about a trumpet shaped single dentinal foramen, which is rarely correctly filled, because wide open; as middle life approaches, lamellae are added, about accessory vessels, producing delta of two or more foramina, in forty per cent of specimens studied, making still more difficult complete pulp extraction and filling; in old age, or any condition, as pyorrhea, increasing apical bite stress, cemental hyperplasia is induced, closing so many of these openings as to frequently make pulp nutrition a mystery, such foramina are very easy to fill, if not perforated in the attempt, because they are already filled. The predominating cementoblasts and open cell structures, the passage of many vessels, assuring nutrition to the matrix, also supplied by a closely attached peridental membrane, all emphasize the vascularity of the apex; *its reparative powers should appeal to every dentist.* If not burnt up by germicidal processes or too deeply infected, its periphery is often renewed by the cells of the peridental membrane, generally fibro-blasts, forming a secondary lamina reattaching the tissues but to accomplish this, as Noyes explains, these cells must lie in physiologic contact with the cementum, and you cannot expect such repair in apical regions saturated with arsenic, hardened by applying formalin, cresol, phenol, and caustics or destroyed by sodium and potassium or zinc chlorid and ionic medication; a high percentage and excessive use of all of these results in apical necrosis damaging the peridental fibres and producing apical denudation.* If involved on all sides via the canal and with the attaching peridental fibres destroyed by proliferating peridontitis, granulomata or purulence, the the lacunae are saturated with infection, and the apex is both septic and necrosed, retained in the medulla by the two thirds remaining healthy. By none of the methods just mentioned, applied thru the canal, can such apices be sterilized and made normal, nor by irrigation, medication or ionization, can the surrounding lesions be so completely cured as to prevent recurrence. This is a sweeping statement, involving no one more than the writer, it is supported by hundreds of bacteriologic reports, conducted by modern technic, which establish the fact that not one of all these associated diseased tissues, and particularly the apex, when properly obtained avoiding contamination and correctly cultured on all media, failed to show decided uncontaminated growth. Without specifying variations, it may be conservatively stated that the streptococcal type predominates, tho other strains as staphylococcus and pneumococcus occur. Further, while many cysts and granulomata are sterile centrally, definite growth can always be obtained from currettage; or the entire specimen, as in the fibrous wall of the granuloma, where the bacteria are microscopically visible,† just as they appear in joint capsules, and positive results are generally the rule from aspirated material, taken from an area of rarefaction or erosion, indicating by good radio-

*While Dakins' Solution and Dichloramin T have been used successfully by the writer on the soft tissues, there is little evidence of their value in root canals as yet.

†Many have been mislead by this central sterility of granulomata and cysts. Cultures taken via the canal in and thru the apex, often show negative, on the strength of which the operator fills the root, only to find later, that infection still persists in the granuloma wall or medulla.

graphs any phase of apical disturbance about infected canals, no matter how carefully filled, quite the contrary, it can positively be stated, that no such growth has ever resulted from the normal medulla, about teeth with vital pulps, when taken far enough from the infected field not to be involved.

This is an admission of the failure of canal treatment in septic teeth, it means, just so soon as it can be clinically and radiographically demonstrated that diseased periapical regions exist as described, medication should stop and surgery begin, and that every multi-rooted and many single rooted teeth involved, must be extracted with thoro after curettement, apiectomy is successful in single rooted teeth, as previously explained, only when dentin is sterile; in multi-rooted teeth, apiectomy is equivalent to sitting on a three legged stool and sawing off one leg; all of this sounds radical, but in reality is most conservative, both of teeth and health. Sufficient evidence has now been presented to establish, as the very first consideration, the vitality of the apical cementum which must not be destroyed in pulp devitalization; as the second, removal of all pulp remnants, as far as possible, in the field to prevent foraminal putrefaction and allow passage of canal fillings to the entrance, for it is impossible to force a dense filling into a canal containing pulp shreds, unless they are pushed into the membrane always producing periodontitis if infected; as the third, filling of these openings, and all microscopic areas passing into them with some benign material impervious to moisture, for the apex in situ can never be made dry. The operator who continues treatment and filling of diseased roots in spite of all the foregoing, wastes his time and risks the patient's health, no matter how fine the technic nor method; by perforation, protrusion, encapsulation, or anything short of these, nor how aseptic the procedure, if the apex and environment be septic. Quite the reverse is equally true, *if the apex be vital and the pulp can be promptly removed well into, but not thru the foramina; and the whole apical area pumped, under aseptic precautions with Callahan's chloroform and rosin,*—which the writer has seen properly stained as a test, forced well into the dentinal and cemental matrix apertures sealing them, even when moist, possibly by varnishing in the remaining bacteria,—*then any material that completes foraminal closure with as little shrinkage and disturbance as possible, may be used.* None of the numerous substances employed for this purpose are satisfactory; the preference being so-called gutta-percha, (gutta-percha impregnated with radio-opaque oxids) open to the objection, that when dissolved sufficiently to flow, it contracts: undissolved, it does not close the foramina; as a second choice, are all of the cements, which are more or less irritating. Needless to add, that this operation demanding more care and patience than any other in the realm of surgery, because of variations in root angles and canal lumen, is not always successful; in that event, the best possible operation must be done and kept under X-ray survey, the patient agreeing to extraction on the least disturbance; under no other condition should we assume the responsibility, for "the game is not worth the candle." It is possible, that vital apical pulp remnants and the afferent vessels left in foramina, may be accessible to the beneficent cell elements and fluids of the peridental membrane and stimulate those nearest to repair by fibrosis which later may be organized into cementum; but this is quite impossible, in the presence of infection or the pernicious methods of filling apices permanently with formalin pastes or "perpetual deodorants." The practice of deliberate perforation, where perchance it may open one foramen, ignoring others; or cut another opening is officious, always complicating a situation bad enough, *for it is impossible to detect radiographically, multiple foramina;* and by perforation

much of the backward pressure so necessary to filling the entire field, is lost because the chlorapercha flows easily to the soft tissues, or even under aseptic precautions infected particles of apical detritus not reached by any sterilizing method may be forced out into the soft tissues. No matter how many canal points under pressure be used, the substance pumped thru, if soft enough to flow is still contracting chlorapercha; fortunately, it is not possible to force this far into the peridental membrane, because contrary to the books, there is no such thing as "the apical space;" so in the normal, even when aseptically accomplished it invades and protrudes into a real tho fixed joint; having normally a certain amount of movement, creating a locally lowered resistance, which may flare up at any time, but generally, infection passes with it, producing periodontitis, misinterpreted as operative reaction. In the abnormal, it flows over the cementum denuded by periodontitis, forming an encapsulation; or out into a point or ball, filling a granuloma or cyst, according the resistance offered by the granulations and in the study of post-operative specimens, *it is rarely removed with the root; but is held in the medulla, so it does not encapsulate after all,* and cultures always show infection in the underlying cementum.*

There can be no question that gingival and periapical disease is both liquifying and proliferating, hence in the nature of the alveolar and medullary communication, it can and does progressively involve adjacent vital teeth; it cannot always be cured by the dentist, equally frank with his patients and himself, it would therefore appear *that the best of dental reasons exist for thoro eradication of all such disease, if the remainder of the denture is to be retained in health and restored.* But there is still another more cogent reason, universally and clinically accepted by all scientific internists; fortified by a mass of pathological and bacteriological evidence existing in the fact, that in the last ten years oral conditions here discussed *have been proven a menace to those who are healthy, as well as active, often the primary factors in general disease.* Therefore, the same reasoning holds for both physician and dentist, if the patient's health, as well as his denture, is to be maintained; *all such lesions should be prevented, or when they occur, must be eradicated promptly, while resistance is high, without waiting for the patient to fall ill of diseases ascribed to septic teeth,* for instance before fixed changes may arise in a joint or a heart suffer irreparable damage. The period of incubation is indefinite, while a few patients suffer ill effects of an oral nidus, shortly after it occurs, as the abscessed molars of children, related to endocarditis; the majority carry such areas for years, free from local or systemic symptoms, until some other cause, disease or age (after 40) lowers general resistance; this is especially true of proliferative granulations, walled off by a condensing osteitis, lying in the medulla; the crypt and sac wall, apparently without reason breaks down, the granulations proliferate, accompanied by no local symptoms or pain, and are discovered, only by progressive radiographs; then, general symptoms later arise, making possible a diagnosis of systemic invasion. Many interesting questions remain unanswered, for instance, How is it possible for such a small nidus of granulations, walled off by a condensing osteitis to produce profound systemic invasion, and, Why is this focal form, clinically more virulent than the fistulous or pus type? This latter has been explained, in part, by the fact that *oral foci are not only portals for entrance of bacteria; but areas where, undisturbed, virulence or adaptation may be raised.* Rarely do any of these types disturb the blood picture, sufficient for diagnosis, unless in-

*Callahan's rosin if pumped thru with chlorapercha will attach it to denuded cementum: beautiful encapsulation can be done with any of the cements under pressure.

volving large areas; the differential blood count varying not more than from a hearty meal, Simon's septic factor is absent while complement fixation is not definite. *Extraction without* curettement, occasionally affects the temperature reading about a degree, and considerable reaction may occur, because; the granulations still remain and the infected fluid content of the area is forced into lymph spaces, which are not cleared by curettement; *but with the always necessary and thoro curettement,* unless large new bone areas are involved, as in impaction, reaction and temperature change is rare, possibly due to removal of lateral medullary granulations which cannot be extracted with either root or granuloma. There are notable exceptions to this rule, as in muscles and joints and embolic pneumonia, serious cardiovascular and nephritic changes, etc., have occurred; all such suspected cases should be kept in bed under strict hospital regime, however there could be no better illustration of the value of applying modern principles of the clean blood clot operation to common "tooth pulling," than the comparative rarety of these reactions.*

Simple tooth extraction rarely removes the diseased adjacent tissues, granulomata cysts and infected unorganized granulations lying and progressing deep in the medulla long after removal and replacement, are often found by radiograph and the internist and patient are frequently mislead, the treatment and recovery seriously delayed, the patient having lost his teeth, yet still toxic from an obscure septic nidus, so radiographic review of the doubtful post-operative areas and the edentulous, is advisable. *The ambulent patient may be very ill indeed, or the bedridden not so seriously affected,* therefore the dentist has no right to pose as an internist, and settle instantly a diagnostic problem, puzzling the finest diagnostician, by jumping to conclusions regarding the patient's "comparative susceptibility"; his decision, as to whether or not he shall dally with a septic tooth should not be based on a printed chart; where the patient says, "Yes," when asked if his grandmother had "chilliness" and "growing pains?" or "No," if his father had "rheumatism." Susceptibility is a complex question and we cannot know all things equally well: with an enthusiastic and growing interest in the relief of all ills arising from focal infection, *our duty is to attend to our own business, that great domain, which in its broadest expression of real oral prophylaxis, is almost too big for any one man.* Cognizant of the foregoing the dentist, unaided in his office, should not operate upon such cases, unless he obtain the sanction and supervision of the medical diagnostician. The physician has no right to reach hasty conclusions, and, blaming gold crowns and bridges, tell the patient, "it's his teeth," thereby involving the dentist, when he has not carefully examined for other foci; much trouble and delay thus results from "whittling" on the patient; pouncing upon teeth, which are ordered out; next tonsils; then sinuses or genito urinary, and so on. A complete diagnosis should first be made containing the opinion of all specialists concerned, including ample laboratory tests, a regime mapped out, and then executed, as speedily as the patient's resistance will permit. All medical and dental, even secular, literature, has been filled with misleading statements of marvelous recoveries, with no other treatment but tooth extraction, which are harmful and misleading; this "yellow" journalism results, largely from a "half baked" diagnosis which perceives but one primary septic nidus at a time, when as a rule, they are multiple *and who shall say which is the active portal?* All must be considered, and if recovery is expected, the case must be handled in a broad

*Reactions are more general and serious from areas of purulence plus granulations than from locked granulomata and particularly from pyorrhea in extraction and too radical periodontic treatment.

way. In the last seven years it has been the writer's privilege to see a very large number of dispensary, public and private ward hospital patients; what follows is the result of personal observation confirmed by histories, laboratory data, and the opinion of associated specialists. Dentally, these patients may be divided into, First, the very poor, or those who allow septic roots to remain in their mouths and never consult a dentist, radiographs and post-operative findings, with few exceptions, show no greater local and systemic damage, than in the rich who retain the same type of roots, beautifully filled, and crowned and bridged. Second: Those who have every aching tooth out and have lost many teeth; the mouth is filthy, sadly needing restoration; but with little local or general evidences of focal infection, except the gingivae. Third: Those patients of the advertising parlor, who have many vital teeth shell crowned needlessly, which show no periapical, but much gingival disease. All septic roots and doubtful teeth are lost, because the advertiser does not waste time on recurring pain or on abscessed teeth; he frequently hastily devitalizes, and immediately fills with mumifying paste, the pulpal chamber, in pulpitis and the tooth is shell crowned at once. An astonishing percentage of these show no radiographic evidence of apical disease, and, on extraction and examination shreds of apical pulp, vital sometimes, will be found in the apex or it may be filled by cementum or secondary dentin very few of these displaying rarefaction. The writer is not recommending such procedure, but is stating a fact. When the dental parlor patient appears prosperous enough, to tempt the operator to save all of his teeth by filling or bridging, the inevitable oral sepsis is horrible; and damage to maxillae and health very serious. Fourth: The private and often wealthy patient shows most remarkably the skill of our profession in restoration, in prevention of caries and control of gingival lesions; when radiographed, however, while in many instances the root canal work is good, rarefaction and post-operative findings show just as much local damage, and the general disease arising therefrom, as in the teeth of the poor, which are open to reinfection and saliva. This unquestionably proves that while fine treatment and canal technic is most important, all is of no avail, if the apex is infected and left so. Many other deductions are possible, if time permitted, about which you may draw your own conclusions. Among the diseases arising from the oral focal portals, associated as primary or secondary factors; confirmed by interested specialists, may be mentioned, localized and metastatic osteitis, osteomylitis, periostitis and lymphadenitis.

The tonsils as locally involved by gingival and fistulous exudates, indicating that the mouth should always be cleared up before tonsillectomy or any gastro-intestinal surgery, *if the patient's condition will permit.* The invasion of the antral floor by purulence from infected roots and pyorrhea pockets, but especially from proliferating granulations apical to pulpless teeth, *happening in forty per cent of the cases, but not always inducing sinusitis;* however, a pulpless tooth with the slightest break in the lamina dura, should not be allowed to remain in the sinus floor. The eye, as involved in keratitis, choroiditis and vague persistant iritis, formerly classed as rheumatic and the skin in acne erythema and eczema. The infectious phases of arthritis and rheumatism tho this large group responds less readily to ablation of oral foci than any disease here named; and evidently there exists some other unknown etiologic factor; after fixed joint changes occur, particularly in the old, it is useless to destroy the occlusion and deplete the patient, with no possible result; and it is most unfortunate indeed that this group was among the first, where focal infection was related to disease. In myositis and

neuritis, neuralgia and reflex neuroses, results are excellent and there is a definite relation in embolic pneumonia, pleuritis and asthma. Mouth foci are active primary factors in endocarditis, pericarditis, myocarditis and nephritis; stricture of the ureter and urethritis, are often relieved. As preventive of infection in any disease, whether infection is said to be the etiologic factor or not and in many phases of the chronic, sometimes, incurable expressions of the cardiovascular-renal syndrome; beginning hypertension and arterio sclerosis and hyperthyroid state, a thoro oral clean-up is important. Gastro intestinal and duodenal ulcer, altho not quite along Rosenow's etiology; gastritis, gastroenteritis, and gastric catarrh; achylia gastrica, particularly of pernicious anaemia; gastric neuroses and gastric toxaemas of obscure origin: benign anacidity, with associated disturbance. Many obscure conditions simulating malignancy of the stomach and liver, which is enlarged, also toxic hepatopathy. All anaemias, particularly of the chronic secondary and pernicious type, with enlargement of liver and spleen. Septicemia, pyemia, and milder forms, simulating septicemia; especially streptococcus veridans infections. A group of functional neurotics and psychasthenics and obscure cases of chronic invalidism, particularly after age of forty, who under proper regime and oral clean up gain weight and get well.

In the light of the foregoing, it is inconceivable that the medical man should make complete studies of all other organs and overlook the mouth; the Wasserman, Neiserian and Tuberculin and Protein tests are demanded; very exact urinary, cardio-vascular; respiratory gastro intestinal and metabolism determinations are made, the blood is carefully differentiated; in fact every diagnostic precaution observed, and then the oral condition neglected. Such practitioners must learn that radiographic studies, interpreted by conservative dentists, are indispensable to every diagnosis and that the oral examination should be just as much routine in the hospital as a Wasserman; this rule applying, equally to private practice. If we were to indulge in unfriendly criticism or censure, it might be said that the dentist, who errs in an honest effort to save infected teeth, is less negligent and culpable than the physician, who examines the tongue and pharynx and never sees the teeth; but this great question will never be settled by recrimination; it can only be studied in the friendly cooperation, arising out of mutual respect by both physician and dentist. Finally it may be said, that the writer does not agree with the oral surgeon, who radically condemns every pulpless tooth; *on the contrary he knows it is possible, if the patient will present in time, to remove the pulp and aseptically fill vital root apices, of a large percentage of such teeth, with no post-operative periapical infection, a fact which can be established radiographically and by cultural tests, but he does not believe that an infected or abscessed root apex should be retained for a minute, nor would he spend that time on one, unless attempting apiectomy.*

If there be anything worth while in this paper, or anything of merit in prevention of oral sepsis, it lies in the relief afforded the defensive forces of the body, in the fight with a long continued but minute daily invasion, by the closure of the gingivo-peridental and dento-alveolar focal portals; which, if attempted, must be thoro, and uncompromising; and its principles should be equally applied to all who consult us, sick or well, for an obscure oral nidus may be the final factor, making for health or disease.

SOME DENTAL ANOMALIES AND THEIR TREATMENT.

By Chalmers J. Lyons, D. D. Sc., Ann Arbor, Michigan.

(Read before the Mid-Winter Clinic Atlanta, Ga., March 15, 1918.)

MORE than a quarter of a century ago it was recognized that during the eruption of the teeth, the brain and the nervous system, the stomach and whole intestinal tract, the circulatory and respiratory systems, all show an increased tho varying liability to irritation.

Years ago that great master in Oral Surgery, Dr. James E. Garretson, taught that the process of the eruption of teeth caused many disorders thru reflex disturbances in various directions.

For years unerupted teeth have been recognized as etiological factors in the production of cysts of the jaws. In spite of all this knowledge little attention has been given to the subject of dental anomalies by writers upon surgical topics. The comparative scarcity of literature along this line has perhaps led to misapprehensions regarding diagnosis and treatment and conservative methods which would result in benefit to the patient, have too often given place to uncalled for radical operations, obviously detrimental to his comfort and appearance.

It is to some of these abnormal conditions that the writer purposes to call your attention at this time.

The human family has, thru centuries of use, established what we call a normal condition of the occlusion and arrangements of the dental organs. It has been so established because it is a condition that is most favorable for their function.

Now when a variation from the normal occurs which is a disadvantage or a disturbance of function, we naturally look back to discover if possible the cause of the deviation from normality. It has been contended, altho not clinically proven, that there is a tendency to degeneration of the jaws of the human race and that the continual development of the nervous system is accomplished at the expense of the osseous system. Thus the more intellectual the human race becomes, thru the process of evolution, just in that ratio will the osseous system become depleted.

The disciples of Darwin believe that as we ascend the scale in so-called civilization, we lose some of the factors that were necessary for the maintenance of life in the primitive man. As an illustration,—the animal depends upon its physical strength for its food and its protection. The bony frame work comparatively is very strong. The bones are large, long and the prominences upon their surfaces for the attachment of muscles are very marked, thus indicating that the muscles are large and strong. As we ascend the scale to man, we find that the bones are comparatively small in diameter, and shorter, showing that the muscles are not so large and strong.

Great changes take place in the jaws and teeth. They become smaller in size, the teeth change their shape, because man is now no longer required to procure his food with his teeth or to protect himself with his jaws. The tem-

poral muscle, zygomatic arch and jaws decrease in size and are not so prominent. [1]Talbot has stated that if we compare the jaws of the orang and chimpanzee with those of the esquimaux, we observe a wonderful difference in regard to size, shape and character of the jaws and teeth. If we now compare the jaws of the esquimaux with those of our working classes, and these latter with the jaws of young people of the well to

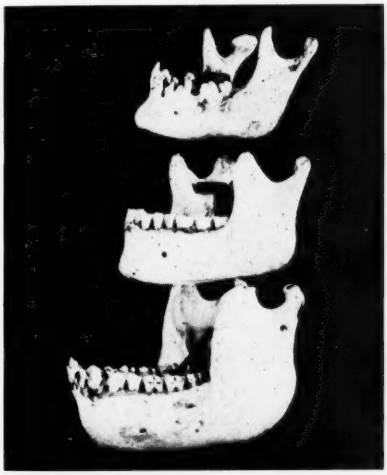

Figure 1.

do classes who are not required to work physically, we shall observe almost as great a change as between the jaws of the chimpanzee and esquimaux. Figure 1—jaws of chimpanzee, esquimaux and civilized man.

Much of our food today is prepared in such a manner that mastication is almost unnecessary and arrest of development of the jaws must follow as a result. While the etiology of all dental anomalies cannot be accounted for by arrested development of the osseous structure of the jaws, many of them originate in this manner. Others are caused by some structural changes in the early development of the teeth and jaws.

We will first consider the impacted lower third molar. This condition is in the large percentage of cases caused by either lack of normal development, or by arrested development of the inferior maxillae. The second molar immediately in front and the coronoid process behind bound the space accorded to the third molar. Each tooth which has no deciduous predecessor is developed beneath the base of the coronoid process, that is the first, second and third permanent molars. The only manner in which these teeth are able to take their places in the normal arrangement of the teeth in the jaw is by the physiological absorption of the anterior surface of the coronoid process. While this process of absorption is going on, on the anterior surface, thru the laws of compensation, nature has provided for a deposition of bone on the posterior surface. Thru these two processes, absorption and deposition of bone, respectively, all of the molar teeth are able to erupt into their proper positions. Figure 2 shows developmental stages of first, second and third molars.

However, when either of these physiological processes in the process of development of the mandible is arrested, the interval between the anterior surface of the coronoid process and the last erupted tooth which is usually the second molar, will be insufficient for the normal arrangement of the presenting third molar. Under these conditions, the tooth in pressing forward, takes a direction in which the least resistance is offered to its progress and a condition becomes manifest which we term impaction.

Another condition which must be recognized in accounting for the malposition caused by the impaction, is that the tooth has been directed from its course at a comparatively early period of development, irrespective of resistance offered at the time of eruption. This condition may be accounted for by a

[1]Talbot—Degeneracy of the Jaws of the Human Race.

change in the character of the cancellous bone immediately adjacent to the developing tooth. If, thru some inflammatory process peculiar to the individual or by the same process set up thru some pathological disturbance, or trauma, a secondary deposit of dense bone is laid down, around the developing tooth, a change in direction of eruption of the tooth may take place or there may be a prevention of its eruption entirely. This retarded condition is also due to the fact that at the points where all of the other teeth are located, soft spongy bone or alveolar process is found and absorption of tissue takes place more readily at these points than at the point of eruption of the third molars which is made up of dense cortical or true bone. Frequently it will erupt until it comes in contact with the second molar and then stop on account of insufficient space in which case only a small part of the tooth will be presented. The upper third molar presents an entirely different condition on account of the difference in the character of the bones in the upper and lower jaws. When, for any reason there is a retarded development of the upper jaw which makes it shorter in its anterior posterior diameter, so that there is not sufficient room for the normal eruption of the third molar, the crown of that tooth will point toward the cheek, taking the direction of least resistance in its course. It slides out to the side, being guided by the second molar, which is already in place. If there were plenty of room both upper and lower third molars would erupt without pain which is rarely ever the case.

The cuspid teeth are the next in the series most likely to be impacted. The etiology of this condition is the same as that of the impacted molars, viz., insufficient space for the normal presentation of the tooth in the process of eruption. The cuspid teeth make their appearance long after the eruption of the lateral incisor and some time after the eruption of the first bicuspid. In case of retarded development of the jaws, there may not be sufficient room between the lateral incisor and first bicuspid tooth for normal eruption of the cuspid tooth and a resultant impaction occurs.

On account of the tendency of an erupting tooth to follow the course of least resistance, the tooth will slide out to the buccal or into the lingual surfaces of the jaws. It is also true that at an early period of development of these

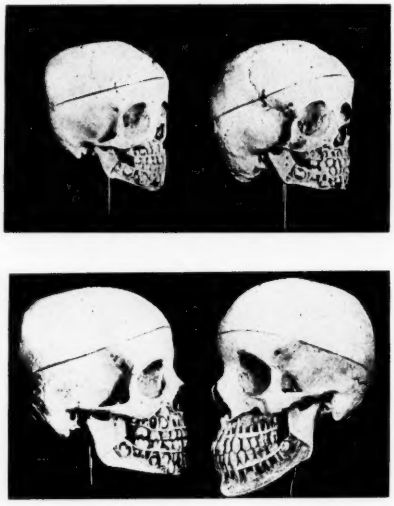

Figure 2.

teeth, that a secondary deposit of bone in the jaws, due to an inflammatory process, may influence a change of direction in the developing tooth so as to change its position entirely when it erupts.

While the third molar and cuspid teeth are predisposed to impaction more frequently than any others, yet any tooth in either jaw may become impacted if the environments are not such that normal eruption can be made possible.

The next anomaly which we will consider is the unerupted or abarrant tooth. This condition may be present in any part of the jaws and any tooth may be the offending member.

There is always a reason for the tooth being unable to erupt normally. The developing tooth meets some obstruction in its normal course such as a supernumerary tooth or a normal tooth which has previously erupted and already occupies the space belonging to the erupting tooth. Again, a previous inflammatory condition in the cancellous bone may have set up secondary deposits of dense bone which will prove an obstruction to the developing tooth and deflect it out of normal alignment.

This subject would not be complete without a few words relative to the supernumerary tooth.

*"Any tooth in excess of the normal number of thirty-two, altho clearly cases of reversion of type, in many instances, are included in the category of supernumerary teeth."

Albrecht and others maintain that the incisor teeth were originally six in number and thus supernumerary lateral incisor would be clearly a reversion of type. Their appearance in any situation is evidence that the normal number of tooth buds has been exceeded.

Guilford divides these teeth into two types, those having typical anatomical forms and those having the conical form.

Supernumerary incisors in either jaw having typical forms are not uncommon. In the upper jaw supernumerary centrals and laterals both may appear, the latter more frequently. Supernumerary teeth may occupy any position relative to the dental arch but are more frequently seen on its lingual surface. In addition to molars and incisors supernumerary bicuspids are occasionally found, while supernumerary cuspids are very rare.

Pathologic Possibilities.

We will now consider some of the pathologic conditions which are induced by these dental anomalies. We will take up first the impacted lower third molar.

Perhaps the most common disturbance we encounter is local infections of the soft tissues surrounding the tooth. This condition is usually present in the partially erupted tooth when the gum tissue which should occupy the space between the anterior surface of the coronoid process and the third molar has been forced out over the disto-occlusal surface of the tooth and becomes confused in mastication. Bacteria laden saliva and food particles are forced into the interstice between the tooth and swollen tissue and infection takes place. Inflammation is set up and maintained, which is not limited to the injured parts, but more commonly extends to the adjacent structures involving the soft textures about the ascending ramus and frequently involving the para-tonsilar region.

Deglutition becomes painful and trismus is set up. Many times the patient is unable to open the jaw more than two or three millimeters. After a time suppuration takes place and the movements of the jaws become less constrained.

In these acute conditions, it has been the writer's experience that immediate surgical procedure is contra-indicated. In his opinion the treatment of choice is to apply counter irritants, the application of cold compresses or ice to the face, and have all of the body eliminating processes active.

After the inflammation has subsided and the jaws have become less constrained, conditions should be restored to normal by surgical procedure to obviate repeated attacks. This condition will be rarely found around other impacted teeth than the lower third molar.

A pathological condition which may occur as a result of any impaction is pressure resorption. When the crown of one of these teeth is lodged or impacted against the root of the adjacent tooth, the hard enamel surface of the impacted tooth will cause a resorption of the tissues of lesser resistance of the other one. This may go on to such an

*Burchard.

extent that the nerve pulp of the adjacent tooth will be encroached upon.

A very serious condition may arise from an impacted lower third molar by pressure being exerted upon the inferior dental nerve. The position of these teeth in the jaws predisposes to impingement upon the inferior dental canal. In such cases a reflected pain may be set up which will be expressed in any part of the head which has its sensory nerve supply from the fifth or trigiminal nerve.

Neuralgia may have its etiology in such conditions. The late Dr. Henry S. Upson, former professor of Neurology in the Western Reserve University, ascribed many of the nervous disorders which "mankind is heir to" to impacted teeth. He stated that "certain types of nervous disturbances caused by dental impactions has almost the clearness of a laboratory experiment as in it, the severest symptoms are set up by the simplest irritant. Pain may be from the beginning to the end quite lacking." It is the constant tho mild irritation, perhaps not sufficient to produce pain, that sets up some of these nervous disturbances which may of themselves take on a violent form.

Alopecia areata, or baldness occurring in sharply defined patches, leaving the scalp smooth and white, is a condition due to a nervous disturbance. The impacted tooth must be considered an etiological factor in this affection.

During the last few years, we have had several cases of this nature in the University Hospital that showed marked improvement after the removal of impacted teeth.

Another abnormal condition that is quite frequently found associated with the presence of impacted lower third molars is a tendency for these teeth in their effort to erupt to force all of the lower teeth forward. Orthodontists have found it almost impossible to retain normal occlusion following orthodontic treatment with these teeth present in the jaws. Many fine orthodontic results have been ruined by the presence and activity of impacted teeth.

What are the pathological possibilities of the unerupted tooth? It is a remarkable fact, and one which has not been fully explained, that unerupted teeth having lain dormant for years in the jaws suddenly become the seat of purulent inflammation with sometimes serious symptoms. Such cases are by no means rare. Some writers are of the opinion that under certain conditions these teeth may act as a foreign body and may even fall a prey to resorption. Under these conditions where an irritation has been set up and purulent inflammation has become seated, a bone abscess may form around the region of the unerupted tooth. This abscess may develop until a large portion of the jaw becomes involved.

Another condition which is frequently seen in mouths of men and women under thirty years, is the cystic growths connected with these teeth whose eruption is retarded. While in the light of our present knowledge the explanation for the formation of these cysts is largely theoretical. Tomes has given the writer the most plausible theory. He states that when the development of the enamel of the tooth is completed, its outer surface becomes perfectly detached from the investing soft tissue and a small quantity of transparent fluid not uncommonly collects in the interval so formed. This fluid ordinarily is discharged when the tooth is erupted, but when from some cause the eruption of the tooth is prevented, it increases in quantity and gradually distends the surrounding tissues, causing a resorption and disintegration of the osseous structures. These cysts may go on developing until a large portion of the jaw is involved.

Again, the unerupted tooth may, by coming in contact with the roots of the normal erupted teeth, cause pressure resorption and thus produce a perma-

nent injury to them. When these teeth lie in close proximity to a nerve trunk, they may cause undue pressure and set up the same obscure nervous disturbances which have been attributed to impacted teeth.

The last of the dental anomalies which we are considering in this paper is the supernumerary teeth. One of the most common resultant consequences of the supernumerary teeth is the obstruction they present to the normal eruption of the permanent teeth. They may

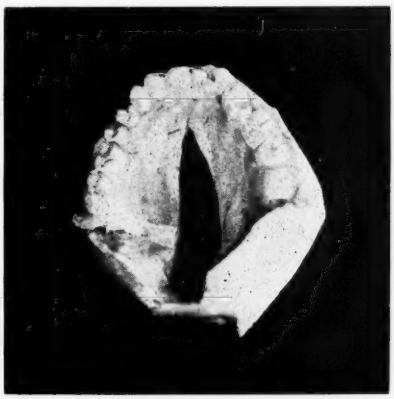

Figure 3.

retard or entirely prevent the eruption or they may erupt first and force the normal tooth to erupt out of alignment. Warnekros, has written quite extensively on these teeth as an etiological factor in the causation of cleft palate. It is a well recognized fact that in cleft palate there is not a lack of palatine tissue, but a failure of union of the tissue. Warnekros believes that the failure of union is brought about by an excessive number of teeth. He says "as the normal number of teeth during their development requires a comparatively large space, it is explicable that in very many instances, a supernumerary tooth, with the limited conditions of space in the intermaxillary bone which is not yet completely ossified may itself cause a cleft formation in the maxillary bone." In support of this contention which he says he no longer brings forward as an hypothesis, but be declares to be a fact, he cites an extensive series of cases as proofs in which he emphatically states that a supernumerary tooth can always be proved to have been the cause of the cleft. Figure 3.

While we are not yet ready to accept the deductions of Warnekros in its entirety, there seems to be some relation between these anomalies and cleft palate. We frequently find that supernumerary teeth are present in these cases.

The writer, however, is not able to follow his reasoning in clefts of the lip alone or in clefts that do not involve the maxillary processes. It has always been a question with the writer as to whether the supernumerary tooth is the etiological factor in cleft palate, or that the changes which take place in embryonic life which results in cleft palate do not in some manner affect the development of the normal number of teeth.

Treatment.

We have now considered briefly the etiology and pathology of some of these dental anomalies; now what about the treatment?

All supernumerary teeth, whether erupted or their presence only made manifest by means of the röntgenogram, in the writer's opinion should be removed. They are of no value to the patient and in the large percentage of cases are either proving or will prove a positive menace to the normal functioning of the teeth.

The unerupted tooth should be removed when it is suspected of any disturbance. Successful diagnosis is only made by a process of elimination and when these teeth are present in the jaws and the patient suffering from obscure nervous disturbance, the removal of them is indicated in order to eradicate a possible source of trouble. Their removal, together with the entire cystic lin-

ing must be accomplished in cases of dental cysts. This should not be attempted without the evidence of a good röntgenogram, which should point out the location of the tooth and the dimensions of the cyst.

In fact, the removal of any unerupted tooth should not be attempted without a good röntgenogram for the reason that any unnecessary cutting or laceration of the tissues is not permissible in these operations. In the removal of these teeth the writer prefers the uncovering of them by means of a chisel and mallet, thus the landmarks are not destroyed which otherwise might be the case in the use of the bur and engine. After the location of the tooth and the character of its environments have been determined, the use of the bur or drill is permissible in the further removal of the osseous tissues in permitting of their dislodgement.

The operation for the removal of the impacted tooth is a subject which of late has been attracting considerable attention, particularly that of the impacted lower third molar. In the removal of the impacted tooth other than the lower third molar, no definite technic can be followed as each case will present entirely different conditions.

In the removal of the impacted lower third molar, however, the writer believes that it is possible to follow a definite technic in practically every case. In other words, the operator should have a clear conception of the whole situation and know exactly what has to be accomplished in order to remove the tooth with the least amount of traumatism. Dr. C. Edmund Kells, in a paper on Impacted Lower Third Molars, in February, 1918, Dental Cosmos says: "There appears to be two methods of removing these teeth. (1) One in which the patient's jaw is chiseled away to such an extent that the tooth may be taken out whole, ether or novocain being used, according to the fancy of the operator.

(2) The one in which the tooth itself is cut in two under novocain. The patient's jaw is handled gently and the tissues surrounding the tooth are injured slightly.

As the mallet and chisel in conjunction with surgical drills and elevators are the instruments that the writer has found most satisfactory in his hands for the removal of these teeth, he must take exception to the erratic statements made by Dr. Kells. It is true that a novice or a bungling operator may mutilate or lacerate the tissues unnecessarily by the use of the mallet and chisel—so would the same conditions obtain by the practice of what Dr. Kells terms "his method," in the hands of the same class of men. It is unfortunate that Dr. Kells did not attack the personal ability of the operator instead of methods. The writer feels very sure that Dr. Kells can remove an impacted lower third molar by "his method" with the least possible amount of traumatism. The writer also feels very sure that there are many operators who, by the use of the mallet and chisel, drills and elevators, can perform the same operation with no greater amount of traumatic injuries and no greater inconvenience to the patient. He says "under the mallet and chisel operation a large block of the external oblique line is cut away and a large surface of the porous bone is left exposed." The writer has never had a case where it was necessary either in his private practice or in the clinics at the University of Michigan, neither has he observed this condition with other operators who were proficient in the use of the mallet and chisel.

The lower impacted third molar as we have stated, follows the path of least resistance in its attempt to erupt. The path of least resistance is certainly not in the dense cortical bone such as is represented by the external oblique line but rather at the base of the retramolar fossa and it is not necessary to go out-

side of the retramolar fossa with the chisels in order to remove the osseous structure above the tooth. In a large percentage of cases little or no more traumatic injuries are made upon the osseous tissue than in the extraction of the first or second molars.

The difference in the character of the process of repair of the two wounds being due to the extent of the pre-operative inflammatory process present, which is usually very much greater in the case of an impacted molar.

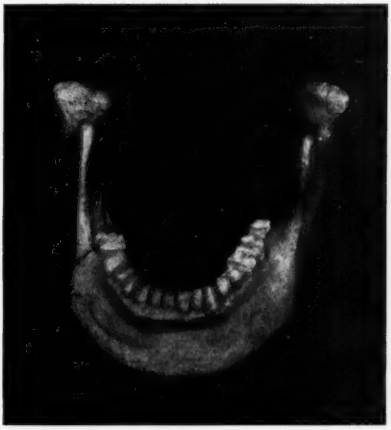

Figure 4.

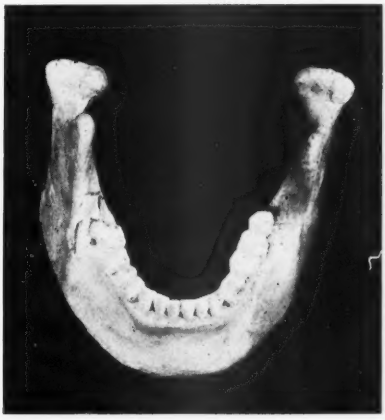

Figure 5.

We will now outline the technic which has been most satisfactory in our hands.

After the field of operation has been sterilized of its gross sepsis and anesthetized, an incision 1 c. long is made along the upper surface of the process covering the tooth. Then a vertical incision is made about 2 mm. distal to the second molar extended to a point half way between the gingival margin and the root of the second molar. (Figure 4). The triangular flap is then raised up exposing the osseous tissue surrounding the tooth. (Figure 5).

The next step is to remove by chisel and mallet a section of the process overlying the tooth to an extent that there will be sufficient space between the second molar and the osseous structure covering the tooth to permit it to be displaced. (Figure 6). A Henahan surgical drill is then used to remove a section of the cortical bone 2 mm. in width contiguous to the buccal surface of the tooth. (Figure 7). The wedge of cancellous bone between this surface and the tooth socket is readily removed with the chisel. Then the chisel is driven between the buccal surface of the tooth and buccal process with the bevel of the chisel next the process and by a prying motion the buccal and lingual plates are sprung apart sufficiently to loosen the tooth. (Figure 8.) Figure 9 is a cross section of impacted third molar, showing thin lingual plate. Then, by means of an elevator, preferably the LeClure, the tooth is rotated backward and out. (Figures 10, 11, 12). At the stage in the operation of using the elevator, the chisel itself may be used as an elevator and the tooth removed. The elevator should never be used until the tooth is seen to slightly rotate in its socket under the stress of the chisel. Until that time, the impaction has not been relieved, and any attempt to use the elevator might result in fracture of the tooth or of process.

This same principle is followed with any degree of impaction and also with one that is not only impacted but unerupted as well. The cutting should all be done from the buccal surface, as there are no vulnerable tissues at this point, while on the lingual surface the lingual nerve and artery might be injured if much cutting were attempted. Under novocain anesthesia there is very little hemorrhage and this is controlled by a gauze sponge inserted on the buccal surface adjacent to the operative field.

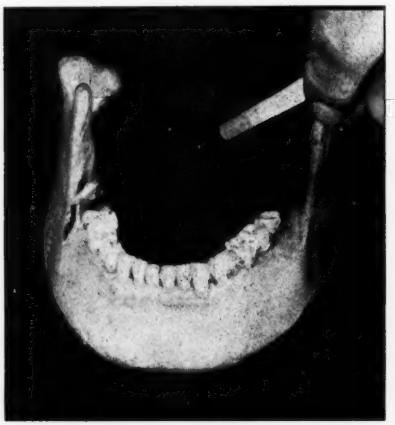

Figure 6.

Figure 7.

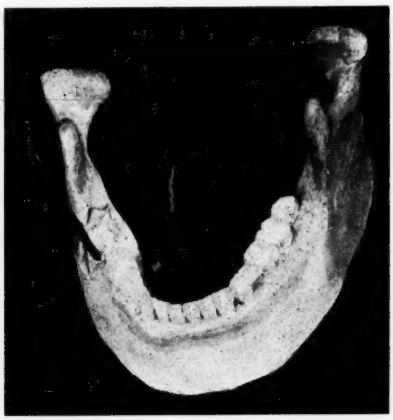

Figure 8.

There is one great point for the operator to keep in mind and that is that the impacted tooth is wedged into the jaw and the impaction has to be relieved before the tooth can be removed. This may be done with burs, drills, stones, cutting forceps or chisels. The wound

Figure 9.

made from the chisel is a clean sharp one and not rough and ragged such as made by burs. Consequently repair will take place around a wound made with a chisel much quicker than if the tissues are lacerated by burs.

POST-OPERATIVE TREATMENT.

The procedure which has been very satisfactory in the writer's hands is to incorporate euroform paste in either plain or iodoform gauze for 24 hours immediately after the operation. This preparation is antiseptic and its sedative action is most beneficial.

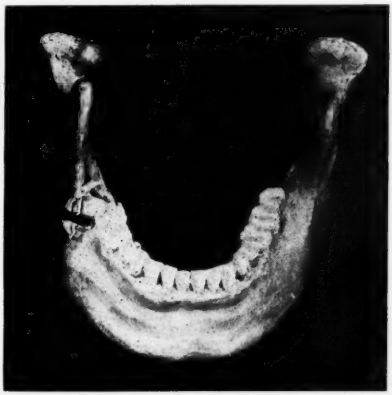

Figure 10.

At the end of 24 hours the dressing is removed and the patient instructed to use a warm 5% salt solution as a mouth wash.

The wound is to be kept free from all food deposits and debris by the use of sprays of 5% salt solution, until repair takes place. No curettements are necessary in these cases unless an abscess condition is present in which case curettement of the socket is indicated. In cases of post-operative pain, asperin 15 gr. may be given as a nerve sedative.

In closing I will only add that a thoro knowledge of the pathologic possibilities of these dental anomalies, a definite technic for their eradication and

Figure 11.

a scientific treatment for pre-operative and post-operative conditions are all essential for success and that the personal ability of the operator will be the predominating factor in the success or failure in their diagnosis and treatment.

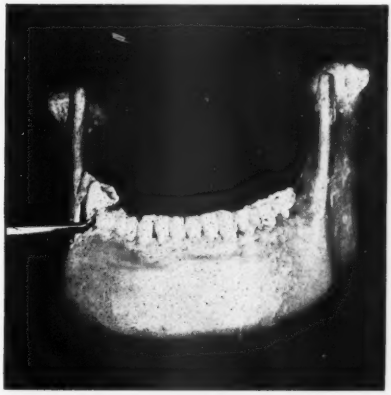

Figure 12.

A REVIEW OF DENTAL LITERATURE. 1917-1918.

By Russell W. Bunting, D. D. Sc., Ann Arbor, Mich.

(Read before the Michigan State Dental Society, April 8-12, 1918.)

AS WE study the literature of our profession for the past year, we are impressed with the effort and research which has been directed toward the problem of dental infection and its relationship to systemic disease. Investigations which were begun and reported during the previous year have been continued and the more recent contributions are for the most part corroborations or amplifications of earlier views of the respective authors. Many of the more notable articles are in themselves exhaustive reviews of the literature upon the subject and detailed expositions of histological and bacteriological data which do not readily lend themselves to a brief resume. Those who wish to really know the subject must study these contributions in the original and for this purpose we have attempted to arrange the titles and references so that they may readily be found.

Drs. Henrici and Hartzell (1) in their report to the National Dental Association take up in detail the microscopic changes in the tissues about the teeth in pyorrhea and dental abscess. Regarding pyorrhea they emphasize the importance of the gingival crevice which they compare to the crypts of the tonsil and the vermiform appendix in its liability to inflammatory processes. They re-state their former opinion that the primal cause of pyorrhea is the non-pyogenic streptococcus viridans and that pus is due to secondary invasion of pyogenic organisms. Extension of the process apically into the deeper tissues is accounted for by the interference with, and involvement of, the blood and lymph channels which run in that direction. In the discussion of abscess, attention is called to the fact that chronic forms do not necessarily follow acute inflammations but that acute abscesses are more often planted on chronic affections. Also, that these chronic forms, which are commonly known as "granulomata" do not contain pus or pyogenic organisms, but are usually infected with the non-hemolytic streptococcus. Then follows a description of the histological structure of these granulomata and a discussion of the literature relative to the origin of the epithelial cells which are found in these growths. In conclusion, they offer data as further proof of their former claims that streptococcus viridans is the chief causative infection in both pyorrhea and dental granulomata.

Three valuable contributions by K. H. Thoma have appeared (2) (3) (4) in which the author gives detailed information regarding the nature and significance of periapical inflammations. In the first paper he classifies these inflammations into first, acute periodontitis with pus formation and the development of an acute abscess with a sinus; second, proliferating periodontitis a constructive process produced by the irritation of non-purulent bacteria and which

results in the formation of a granuloma. He calls attention to the disturbance of nutrition to the cementum and the readiness with which necrosis and absorption of both cementum and dentin at the root-end occurs in the presence of such inflammations. The author agrees with the statement of Grieves that when once the cementum and pericementum of the root apex is devitalized, no process of therapeutics can revitalize it. The great difficulty is to determine by radiogram whether these tissues are vital or not. This he judges by the time elapsed since the death of the pulp, the duration of the inflammation and the distance it has travelled toward the cervical margin.

In the second and third papers Thoma gives detailed descriptions of the various forms of dental granulomata. He agrees with Henrici and Hartzell as to their being non-purulent unless invaded by a secondary pus producing organism. Many are also shown to have undergone various forms of degeneration. Altho these growths are walled off from the surrounding tissue in an attempt to limit the inflammation, the author shows that blood vessels pass in and out freely by which means the infection which the granuloma contains may be transferred to the general circulation. Several sections show very clearly that even after a considerable portion of cementum and dentin have been resorbed by the inflammatory process, new cementum may be laid down on the injured parts to partially or completely restore the original contour of the root.

E. C. Rosenow has contributed two papers to dental publications (5) (6), in which he reaffirms his former convictions regarding the selective action of bacteria in their attack upon various organs and tissues. In the first paper he cites a dental case in which a culture was taken from a dead tooth which had been causing neuralgic disturbance. The culture when injected into animals caused pulpitis in 50%, myositis in 71%, and neuritis in 46%, these being the same symptoms as shown by the patient. In another case animals were injected (intra-peritoneal) with cultures from pyorrhea pockets and they developed peridental inflammation. The author believes this to be a significant observation suggesting that pyorrhea may in the human result from blood-born infections. In the second paper he warns against the placing of too great dependence upon the radiogram stating that a shadow about the apex of a root does not always mean that there is infection present, and that conversely some of the most dangerous types of dental infection are those which lie in the pulp canals and produce no change of the periapical tissues which can be demonstrated by the radiogram. He concludes both papers with a plea for a closer co-operation of the medical and dental professions and suggests that the greatest work of the dentists lies in preventive prophylaxis and in the education of children in the public schools as to the care of their teeth.

Drs. Hartzell and Henrici (7) discuss the various forms of streptococci in the mouth in their relation to dental disease and other forms of oral infection. They disagree with the statements of Rosenow that these streptococci may transmute from one variety to another believing that the pyogenic, non-pyogenic and pneumococcus forms are separate and distinct specie. They also object to the Rosenow theory of bacterial selectivity presenting their own observations and those of A. L. Moody in support of their claims. Moody (8) injected 178 animals with cultures taken from dental abscesses in 30 patients showing systemic disease and 19 patients who were otherwise healthy. He reported that "the lesions produced by organisms from persons without systemic disease are identical with those produced by organisms from patients with systemic disease." He further states that "the localization

of streptococcus viridans cannot be determined wholly by some property inherent in the organism itself." As Tean Broadhurst says, "streptococcal infections are those of opportunity rather than specificity." Hartzell and Henrici (7) conclude their paper with the assertions, which they have attempted to prove, that the streptococci are the most numerous of all mouth flora and that they are the only true parasitic flora of the normal mouth. Further; that streptococci are the microbic causes of dental caries, pulpitis, alveolar abscess and pyorrhea alveolaris.

A very notable review of our present knowledge of dental bacteriology has been made by K. F. Meyer (9) to which those interested in the study of this subject are referred. The author has compiled in a comprehensive and readable treatise the opinions and publications of the various investigators and has made a schematic tabulation of the cultural characteristics of the various types of mouth bacteria.

A study of the micro-organisms concerned in dental caries has been made by Percy Howe and is reported by him in two articles (10) (11) during the year. He states that the total bacterial flora is not necessarily increased in cases of caries susceptibility but that the relative rate of acid production is usually larger. The organisms which he finds to be invariably present in dental caries is not the streptococcus viridans but a group of bacilli which correspond to the Moro-Tissier group. He describes the various forms and shows microphotographs in illustration. It is his opinion that since these organisms are the constant and predominant flora of dental caries and as they have high acid forming properties, they must be concerned in the inception of that process at least.

No issue of a dental journal is complete today without an article on root canal technic. These articles are for the most part reviews of the literature and descriptions of methods of practice adopted by the author. J. P. Buckley (12) outlines his treatment of pulp-canals advocating the use of formocresol to partially sterilize gangrenous pulps before attempting to remove them. Also phenolsulphonic for the opening up of constricted canals and xylol for the removal of old gutta-percha points. Elmer Best (13) gives in detail the method which he employs advocating the use of formocresol, sodium potassium, and sulphuric acid, filling the root canals with gutta-percha and rosin. He pleads for aseptic root-canal surgery and shows the methods of preparation and sterilization of instruments.

Carl Grove, in two papers given before the Washington State Society (14) (15) objects to the use of formocresol in root-canals, citing his publications of a year previous in substantiation of his claims. As a substitute he offers a preparation composed of chloral hydrate and menthol in equal part slightly diluted with alcohol. The chloral hydrate combines with the ammoniacal compounds formed in putrescent pulps and both ingredients are distinctly antiseptic. He uses a 10% solution of cresol in glycerin as a root-canal dressing and advocates hydrochloric in preference to sulphuric acids for opening canals as the products of combination with the tooth are more soluble. Warning is also given against drilling thru the apical end of the tooth to make a large foramin and the injury of the periapical tissue with strong drugs.

The most notable contribution to this subject for the year has been that of Percy Howe (16) who worked out a method of depositing metallic silver in the tubuli of the dentin. The purpose of such deposition is that of sterilization of the dentinal tissue and mechanical occlusion of the tubuli to prevent subsequent entrance of infection. Its use is suggested to sterilize dentin overlying

a nearly exposed pulp, to sterilize the contents of a putrescent root-canal, to relieve pericementitis after pulp removal, to occlude the small multiple foramina at the apex of the root, to treat a chronic abscess, and to coat over the end of the root after apicoectomy. The method of application consists in the use of two solutions, one containing silver nitrate in ammonia and the other 5% formalin. The ammonium silver nitrate is first applied to the dentin or root canal to be treated and then the formalin is added which precipitates out finely divided silver on the surface and in the tubuli of the dentin. The author and his collaborators claim very beneficial results from the use of this method in the treatment of diseased and infected teeth and assert that in this manner they are able to completely sterilize infected dentin and root-canals in a comparatively short time.

Brooks and Price (17), in a report of a long series of experiments on various medicaments corroborate the claims of Howe as to possibility of sterilizing infected root-canals by the formosilver method, stating as their belief that a perfected technic would produce sterilization of tooth structures in ten minutes. They, however, call attention to the disadvantage of the method, namely discoloration due to the silver, irritation from the formalin and the toxic properties of both substances. They also test the efficiency of a long list of antiseptics and germicides which are commonly used in dentistry. The results which they obtained from these tests lead the writers to the following conclusions: that infected dentin and cementum are not readily sterilized by medication; that medicaments placed in root-canals soon lose their power and the cotton in which they are contained is readily infected; that the efficiency of a root-canal treatment is greatest during the first few hours after application and rapidly decreases thereafter; that root-canal dressings tend to become re-infected after 24 hours; that the most efficient treatment is the silver nitrate-formalin method; that Chlorazene and Dichloramine-T are efficient germicides but that they are contra-indicated on account of their irritating properties; and that the success of the average root-canal treatment is not due to the germicidal efficiency of the drugs used but to the high tolerance of nature toward dental infections.

In a paper on "The Therapeutic Efficiency of Oral Preparations" (18) Prinz reviews the methods used in the control of dental caries. The value of oral hygiene and prophylaxis both by the operator and the patient is accentuated as well as the importance of thoro mastication of hard substances. The writer then reviews the various mouth washes and dentifrices which have been suggested and outlines the requirements for a safe and efficient preparation as follows:

1. It must be absolutely indifferent in regard to:
   (a) the mucous membrane—non-caustic,
   (b) the tooth—non-decalcifying (mechanical or chemical),
   (c) the organism as a whole—non-poisonous.

2. It must not interfere with the normal physiologic cleansing of the oral cavity, i. e.
   (a) it must not inhibit the secretion of saliva,
   (b) it must not perceptibly alter the reaction of the saliva.
   (c) it must not destroy the ferments of the saliva.

3. It must possess sufficient cleansing action, combined with,

4. Good taste and odor.

With these desiderata in mind, he objects to all preparations containing a high degree of alkali or soap on the ground that they alter the secretions and kill valuable ferments of the saliva. Also those containing potassium chlorate

on account of toxic properties. Preparations containing Carlsbad or other salts are mentioned as efficient cleansers, but are objectionable due to their bitter taste. Vinegar and acid mouth washes, as suggested by Pickerill and Gies, are objected to on the ground of taste and the overstimulation of the salivary glands which results in a killing of the salivary ferments. The writer regards with favor the use of lime water as a mouth wash in proportion of one tablespoon full (one-half ounce) to the glass of physiological salt solution (eight ounces.) He concludes with the statement that sterilization of the oral cavity by commercial preparations cannot be accomplished without harm to the tissues; that the mechanical cleansing of the mouth with brush and inert powder alone will reduce the infection 50%; and calcium carbonate combined in the form of a powder or paste and used in conjunction with the tooth-brush is the safest and most efficient of oral hygienic measures.

In this connection M. J. Waas (19) reports experiments in which he claims to have attained practically complete sterilization of the oral cavity by the use of $IC1_3$ in a dilution of 1/1000. He claims high germicidal efficiency for the drug and states that it is non-toxic or but slightly so. It is, however, acid in its action and may, if used too long, produce decalcification of the enamel.

The question of devitalization of teeth for bridge work has received considerable attention during the year. Difference of opinion is expressed and no standardization of methods has been worked out. In a symposium upon this subject (20) Drs. Eisen, Ivy and Knoche discuss the relation of crown and bridge work to dental infection. The first two authors attempt to classify the types of teeth which should be saved and those which should not. They make a very significant statement as follows: "Difficult as it is for us as dentists to see a mouth wrecked by the extraction of many teeth, we must not forget that the responsibility towards the patient is greater from the standpoint of health than it is from the standpoint of mastication." They cite statistics strongly in favor of crowning teeth with vital pulps and advocate this procedure to eliminate the possibility of subsequent infection. They believe that when the stresses of such bridges are normal the pulps will remain alive. Knoche objects to the use of the gold shell crown and prefers a half crown attachment. He paints the ground surface of the dentin with silver nitrate to prevent the entrance of infection. He does not hesitate to devitalize a tooth whenever it is necessary to good bridge work and he believes the Peeso removable bridge to be indicated in all large restorations. He strongly objects to the extension bar and clasp attachments on account of the leverage which they exert upon the abutments. The alveolar bar is also criticised as it decreases the surface area of the ridge which is to be used for support.

Hart J. Goslee (21) reviews the problems which confront the modern bridge worker and states as his opinion that fixed bridge work should be confined to the restoration of two, three or at the most four teeth, and that larger restorations should be made removable. He praises the removable appliances of Peeso, Ash and others doing similar work, but he asserts that the application of these forms of bridges is limited to relatively few operators and to few patients who can afford to pay for them. He pleads then for a more simple method of construction of removable appliances which might be placed within the reach of all, and describes an ingeniously bended wire clasp having an occlusal rest. This clasp he offers as a solution of the problem, stating as its advantages: 1. Cheapness of construction as compared with other forms of attachment for removable work. 2. The absence of

necessity for immediate destruction of tooth substance. 3. Less strain upon supporting natural teeth. The method which he advocates is described in detail and is fully illustrated by cuts.

On the other hand, a plea is made for the gold shell crown and well constructed fixed bridge work by A. J. Bush (22). He shows some very excellent illustrations of bridges that have failed and points out that the reason of their failure has been gross negligence on the part of the operator who made them. He condemns the overhanging and ill-fitting crown but claims that when properly adapted it has a wide range of usefulness and should not be condemned because of the failure of those which are not so made.

This whole subject was most completely reviewed by Marcus L. Ward (23) in a paper given before the Michigan State Dental Society at the meeting one year ago. He maintained that no one hard and fast method of bridge construction could be adopted but rather that the advantages of all methods should be recognized and their selection should be governed by the requirements of the case. As to the devitalization of teeth, the statement is made that the pulp should be conserved for the filling of teeth or the attachment of small bridges by fillings or inlays whenever practicable, but when a tooth is to be crowned either alone or in connection with extensive bridge work, the pulp should be removed. Warning is made against the devitalization of teeth before the age of 28 or 30. The type of bridge attachment to be selected is, therefore, largely determined by the age of the patient and the practicability of tooth devitalization. Models of various classes of cases taken from the bridge clinic in the College are shown giving the age of the patient, the special features of the case and the type of attachment used. In those of early age, where devitalization is contra-indicated, tending to pyorrhea or stress not heavy, inlay attachments are made, while in the adult cases the teeth are devitalized and full crown attachments are used. The paper is a warning against empiricism in the practice of bridge restorations and is a plea for a more careful study of individual cases and the methods by which they may best be handled.

We would call the attention of those who contemplate war dental service to a symposium given before the War Preparedness League of American Dentists in San Francisco (24). The first of these by Eloesser treats of tetanus and gas-phlegmon giving the various methods of prophylaxis and the handling of advanced cases, the author having had actual observation in military hospitals. The second article by the same author and a third by Capt. John S. Marshall describes the various forms of shell and bullet wounds and their treatment. These are the more notable contributions to dental war surgery which have come to our notice.

The committee realizes that a report of this kind does scant justice to the contributions to dental literature for the year and offer it only as a guide and a stimulus to practitioners to read for themselves what is new in Dentistry. Practically all new contributions to dental knowledge appear first in the professional journals, the reading and study of which is necessary for the practitioner who wishes to "keep up with the times." We believe that it would be of inestimable value if the dentists in each community would organize themselves into study clubs and subscribe collectively for all the leading dental journals as was also suggested by ex-President Bowles in his presidential address last year. At a meeting once a month a summary of the most important contributions for the month might be given by one or two members of the club for the benefit of the others. In this manner each member of such a club would obtain a broad and comprehensive view of the progress of his profession and would find many new suggestions to aid him in his daily prac-

tice which otherwise might have escaped his attention. Similar study clubs have been found to be of great advantage in other fields and they would be of like benefit in Dentistry.

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A STANDARD LIST OF INSTRUMENTS FOR COLLEGES.

By H. E. Friesell, B. S., D. D. S., Pittsburgh, Pa.

IN MAY, 1917, a Committee to standardize instruments for the Army Dental Corps and dental colleges was appointed by Dr. Edward C. Kirk, Chairman of the Dental Committee of the Medical Section of Council of National Defense.

However, the exigencies of the case demanded that a tentative army list be prepared at once, and for a time standardizing of instruments was dropped. At the meeting of the American Institute of Dental Teachers in Pittsburgh, January, 1918, the matter was again brought up and strongly advocated by the teachers of the various schools and representatives of the Dental Manufacturers Association.

A Committee consisting of Dr. Arthur D. Black, Dr. Herbert L. Wheeler and Dr. H. E. Friesell was appointed to take up the work and present to the colleges a standard list that could be adopted for college use at the earliest opportunity with the expectation that when it had been proved acceptable to the schools, the Army and Navy would in all probability likewise adopt so much of the list as their needs require.

The Committee has gone very carefully over the instrument list of the dental schools and has selected instruments for each class of work that give promise of meeting the requirements of the largest number of schools. These instruments were mounted on display boards and photographed and are shown in the accompanying illustrations as follows:

Illustration A—Operative Instruments.

Illustration B—Prosthetic Instruments, Rubber Work.

Illustration C—Prosthetic Instruments, Metal Work; Porcelain work shown in separate group.

Illustration D—Crown and Bridge Instruments.

Copies of these illustrations have been forwarded to each teacher of the subjects covered by the lists with the request that he send to the Chairman of the Committee his comments on the proposed standard list and the names of any instruments missing therefrom which he deems indispensable in his school work. It is the expectation of the Committee that approximately 90% of the instruments shown in the illustrations will be found on the list that is finally adopted as the standard college list.

A careful survey of the various lists now in use shows that about two-thirds of the schools are at present using most of the instruments illustrated, and it is probable that the remaining schools will find it much more convenient to accommodate themselves to the larger part of this selection than to put up with the difficulties of securing odd instruments that are not included in the standard list.

The matter of variations in the form of handles, etc., will then be taken up in a conference with the different manufacturers for the purpose of eliminating

unnecessary and undesirable manufacturing difficulties.

The Committee on Standardization of Instruments will appreciate comments and criticisms from the non-teaching members of the profession as well as the teachers.

Communications should be sent to the Chairman of the Committee, Dr. H. E. Friesell, School of Dentistry, University of Pittsburgh, Pittsburgh, Pa.

The instruments shown in the various lists are at follows:

LIST A—OPERATIVE INSTRUMENTS.

Set Black's Cutting Instruments, 48. Long handle.

1. 9 Hatchets—12-5-6, 12-5-12, 12-5-23, 8-3-6, 8-3-12, 8-3-23, 6-2-6, 6-2-12, 6-2-23.
2. 9 Hoes—12-5-6, 12-5-12, 12-5-23, 8-3-6, 8-3-12, 8-3-23, 6-2-6, 6-2-12, 6-2-23.
3. 6 Enamel Hatchets—20-9-12—R and L, 15-8-12—R and L, 10-6-12—R and L.
4. 6 Spoon Excavators—20-9-12—R and L 15-8-12—R and L, 10-6-12—R and L.
5. 8 Gingival Margin Trimmers—20-(95)-9-12 R and L, 20-(80)-9-12 R and L, 15-(95)-8-12 R and L, 15-(80)-8-12 R and L.
6. 3 Binangle Chisels—20-9-6, 15-8-6, 10-6-6.
   3 Straight Chisels—20, 15, 10.
7. 2 Incisal Hatchets—3-2-28, 3-1-28.
8. 1 Discoid—20-3-12; 1 Cleoid, 20-2-12.
9. 7 Black's Amalgam Pluggers—15-7-12, 25-7-12, 35-7-12, 10x30-7-12, 30x10-7-12, 15x35-7-12, 35x15-7-12.
10. 5 Crandall's Amalgam Pluggers.
11. 4 Burnishers—1 Woodson's double end No. 3, 1 No. 42—7 inches, 1 No. 28—ovoid, 1 No. 26—round.
12. 1 Gutta Percha Instrument.
13. 1 Amalgam Carver—double end.
14. Ivory Matrix Holder—No. 8.
15. Ivory Matrix Holder—No. 1.
16. 2 Agate Burnishers.
17. 2 Tantalum Burnishers.
18. 2 Spatulas—1 Chemical Gloss, 1 Agate.
19. Celluloid Strips.
20. 1 Platinoid Spatula.
21. 1 set Black's Scalers (14 instruments).
22. 1 Porte Polisher (S. S. W.)
23. 1 No. 48 Chisel.
24. 1 set Black's Gold Pluggers (L. H. or Cone Socket).

    1 Holding Instrument—Round: 5-10-3, 7½-10-3, 9-10-3, 5-1-23, 5-2-23; Bayonet: 5-1-0, 7½-3-0; Parallelogram: 10x5-3-3, 5x10-3-3, 12x6-6-10, 6x12-6-10.

    Foot—20-5-2-18, 15x5-5-12, 15x5-3-18; 1 Pair Direct Stroke Quandrangle Foot Pluggers.
25. 2 Gold Finishing Knives, 12 and 18 angles; 4 Gold Finishing Files, 6 and 94 angles.
26. 1 Black's Saw Frame, 1 doz. Kaeber Saws, 1 edge; 1 doz. Thread Saws.
27. 1 Pair Shears.
28. 1 Pair Foil Carriers—No. 11.
29. 1 Chamois Pad.
30. 1 Alcohol Lamp, with mica tray and soapstone tray.
31. 1 Automatic Mallet, 1 Hand Mallet No. 15, 1 Hand Mallet No. 5—Choice.
32. 4 Metal Broach Holders.
33. Glass Slabs for Sterilizing Broaches.
34. Broaches—Barbed; Smooth, round; Smooth, square.
35. 1 pair Dressing Pliers.
36. 2 Canal Pluggers.
37. Sterile Cotton, 1 oz. (canal dressings).
38. 1 Box Absorbant Paper Points.
39. Broaches—Kerr, B.
40. Bottle with Pipette thru cork (for alcohol).
41. 2 Dappen Medicine Glasses.
42. Medicine Bottles.
43. 1 Box Gutta Percha Canal Points.
44. Rubber Dam older—Wizard No. 8.
45. Rubber Dam Weights.
46. Rubber Dam Punch—Perfected.
47. Rubber Dam Clamp Forceps—Universal.
48. Pieces of spunk.
49. 1 set Rubber Dam Clamps—2 Special Root R and L, 140-141.; 2 Special Third Molar R and L, 138-139; Ivory No. 1 Bicuspid; Palmer No. 18.
50. Waste Cotton Holder No. 6.
51. Cotton Holder No. 1.
52. Waxed Silk Floss.
53. Wood Points.
54. Finishing Disks.
55. Finishing Strips.
56. Mandrels—303 Handpiece and R. A.; Morgan Maxfield Handpiece and R. A.; Porte Polishers, 307-307 R. A.
57. Orange Wood Sticks.
58. Straight Burs.
59. Right Angle Burs.
60. 1 Pair Trimming Knives and Wax Carvers—R and L.
61. 1 Sprue and Former.
62. 1 Box Taggart Inlay Wax.
63. 1 Casting Ring and Bucket.
64. 1 Boley Millimeter Gauge.
65. 1 Lowell Pin Vise.
66. Grobert Files, half round, 5 in., Nos. 1, 2, 3.
67. 1 Pocket Lens (2 glasses).
68. Wire Brush (brass).
69. Carving Blocks—Ivory, Bone or Celluloid.
70. Wood Blocks—small.
71. Surgical Case (containing): 1 Scalpel, 1½ in. blade; 1 Tenaculum, 1 Steel Probe, 1 Silver Probe, 1 Grooved Director, 1 Exploring Needle, 1 Pair Artery Forceps, 4½ in.; 1 Pair Surgeon's Scissors, 4½ in. straight; 1 Pair Gum Scissors, No. 23; 1 Gum Lancet, No. 1.

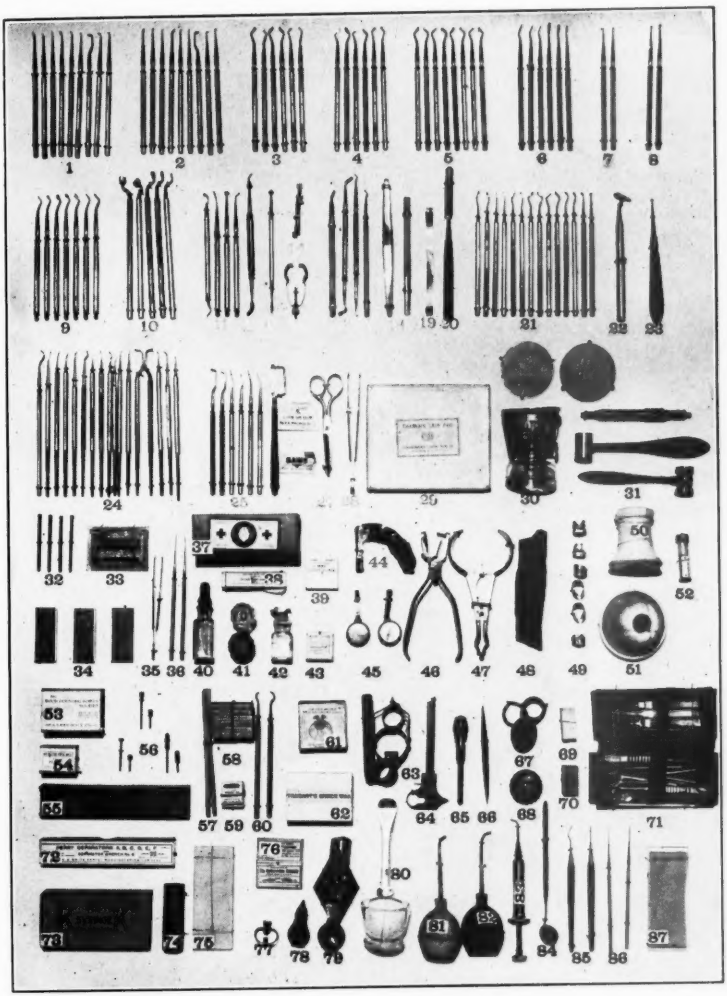

Illustration A—Operative Instruments.

72. 1 Set Perry Separators, 6—A-B-C-D-E-F.
73. 1 Hypodermic Syringe Outfit.
74. Steel Matrix Metal.
75. Arkansas Stone, 6 in.
76. Carborundum Stones and Points.
77. Hatch Cervical Clamp.
78. Mercury Holder (Wood).
79. Alloy Balance.
80. Mortar & Pestle.
81. Chip Blower—No. 22, special nozzle (valve rear).
82. Water Syringe—No. 22, special nozzle.
83. Water Syringe—Metal (self filling).
84. Mouth Mirror.
85. Explorers—6 and 17.
86. Explorers—13 and 14.
87. Glass Slap—6 in.

LIST B.—PROSTHETIC INSTRUMENTS RUBBER WORK.

1. Rubber Plaster Bowl.
2. Platinoid Spatula.
3. Box Modelling Compound.
4. Box Yellow Impression Wax.
5. 6 Impression Trays, Upper 2, 3, 22; Lower 3, 15, 25.
6. Moore's Wax Spatula.
7. Plaster Knife.
8. Shellac Varnish, 2 camel's hair pencils.
9. Talcum Powder.
10. Sandarac Varnish.
11. 1 Box Base Plate Wax, pink.
12. Liquid Silex.
13. Face Bow and Bite Locks.
14. 1 Snow New-Century Occluding Frame.
15. 1 Pack No. 60 Tin Foil.
16. Bottle Vaseline.
17. 1 Whitney Flask (large) with Wrench.
18. 2 sheets Pink Rubber, 4 sheets Red Rubber.
19. 1 Vulcanite Scraper.
20. 1 Set Vulcanite Trimmers.
21. 1 Felt Cone, large, blunt.
22. 2 Felt Wheels.
23. 1 Lathe Chuck.
24. 1 Crocker Lathe Arbor.
25. 1 Lathe Chuck.
26. 1 Polishing Brush Wheel.
27. 2 Stiff Brush Wheels.
28. 1 Chamois Wheel, 2½ in.
29. 2 Carborundum Wheels, 1½x¼ (grit B and D).
30. 1 Mechanical Saw Frame, 2 doz. Saws, Nos. 00 and 2.
31. 1 Gas Burner No. 12 and spider (18 in. Rubber Tubing ¼ in.)
32. 1 Pair Plate Shears No. 1.
33. 3 sheets Sandpaper No. 1.
34. Laboratory Apron—washable.
35. 1 Package Articulating Paper.
36. ½ Pound Prepared Chalk.
37. 1 Pound Fine Pumice.
38. 1 Pad Lock (2 keys).
39. 1 Plate Brush.
40. 1 Can Calcar.
41. 1 Hot Plate (2 ft. Rubber Tubing).
42. 1 Granite Pan (2 qts.)
43. 1 Vulcanizer (2 flask); 1 Vulcanite File. D. E., Half Round, 8 in. (not illustrated).

LIST C.—PROSTHETIC INSTRUMENTS—METAL WORK.

1. 1 Pair Improved Hawk-bill Pliers.
2. 1 Pair Flat Nose Pliers, 4½ in.
3. 1 Pair Pliers, No. 121.
4. 1 Pair Pliers (Common).
5. 1 Pair Pliers, Round Nose, 4½ in.
6. 1 Pair Curved Plate Shears.
7. 1 Pair Crown and Collar Scissors.
8. 1 Horn Mallet.
9. 1 Riveting Hammer.
10. 1 Compound Buffalo Blow Pipe.
11. 1 Soldering Tweezers (long beaked).
12. 1 Soldering Tweezers (A and L).
13. 1 Flat File, Grobet, Half-round, No. 3.
14. 1 Rat Tail Metal File, No. 2, 5 in.
15. 1 Plate Burnisher.
16. 1 Wire Soldering Frame (4x4).
17. 1 Set 2 Casting Rings.
18. 1 Copper Acid Pan.
19. 1 Asbestos Soldering Block, No. 2.
20. 1 Ladle for Melting Metal, with handle.
21. 54 inches Rubber Tubing, 5/16.
22. 1 Piece 30 g. German Silver Plate.
23. ½ Pound 28 g. German Silver Plate.
24. 1 spool 36 g. Annealed Iron Wire.
25.) 12 inches German Silver Wire (12 g.)
) 12 inches German Silver Wire (16 g.)
26.) 12 inches Stub Steel Wire (93-1000).
27. 1 Piece Aluminum Plate, 16 g. (4x4).
28. 5 Dwt. Silver Solder.
29. 1 Borax Slate.
30. 1 Martin's Screw Plate.
31. 1 Draw Plate (special).
32. 1 Stick Rouge.
33. 1 Stock Tripoli.
34. 1 Box Crystal Borax.
35. 1 Box Sticky Wax.
36. 4 inches Steel Wire, ¼ in.
37. 3 Pounds Babbitt Metal (Haskell's).
38. 3 Pounds Counter Die Metal.
39. ½ Pound Special Asbestos.
40. 1 Can Calcar.

Porcelain Work.

41. 4 Thompson's Burnishers, Nos. 3, 4, 5, 8.
42. 1 D. E. Carving Instrument.
43. 2 Camel's Hair Pencils.
44. 1 Pair Pliers, "K."
45. 1 Glass Slab.
46. 1 Piece Spunk.
47. 1 Pair Ball Pliers.
48. 1 Fire Clay Tray.

LIST D.—CROWN AND BRIDGE INSTRUMENTS.

1. 1 set—12, Enamel Cleavers.
2. 1 Ebony or Metal Handle.
3. 2 S. S. W. Root Files.

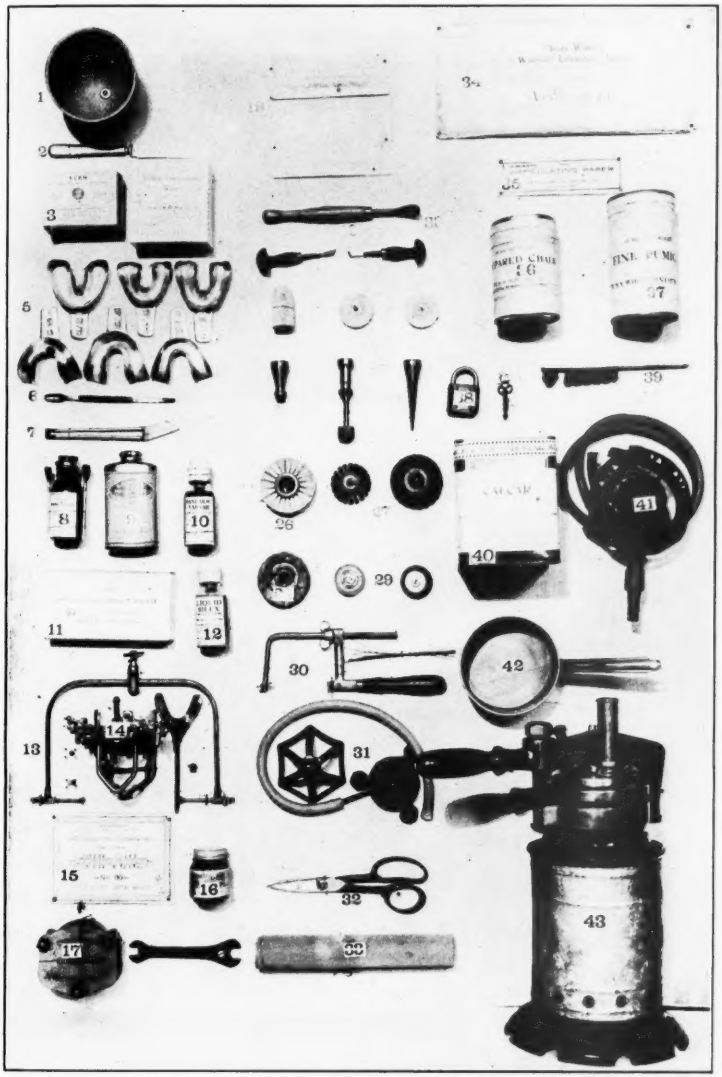

Illustration B—Prosthetic Instruments, Rubber Work.

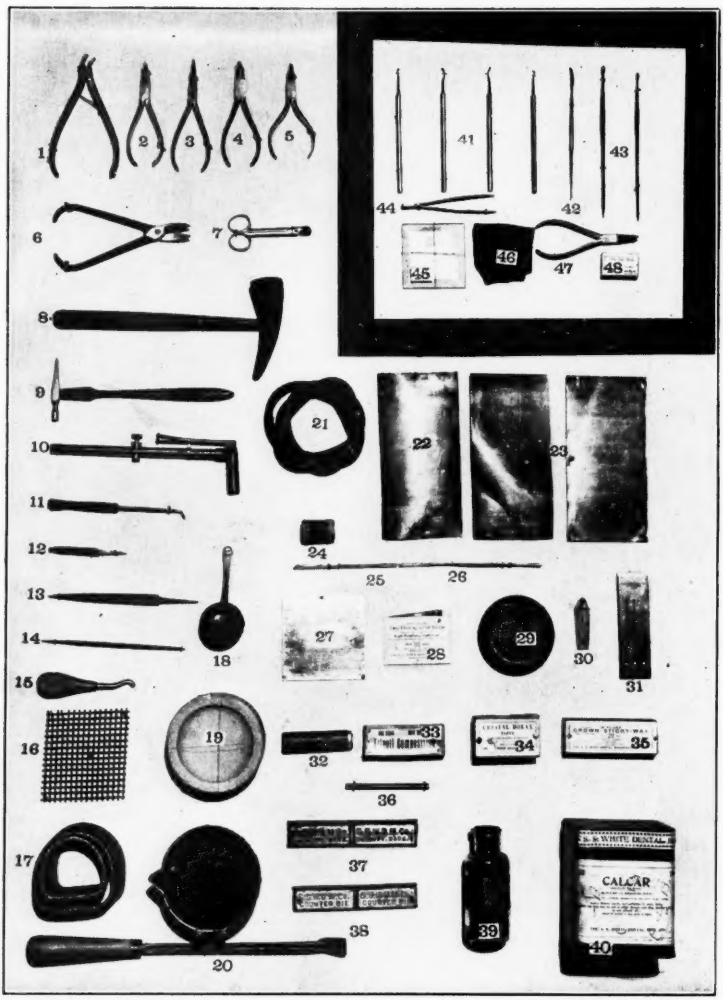

Illustration C—Prosthetic Instruments, Metal Work. (Insert) Porcelain Work.

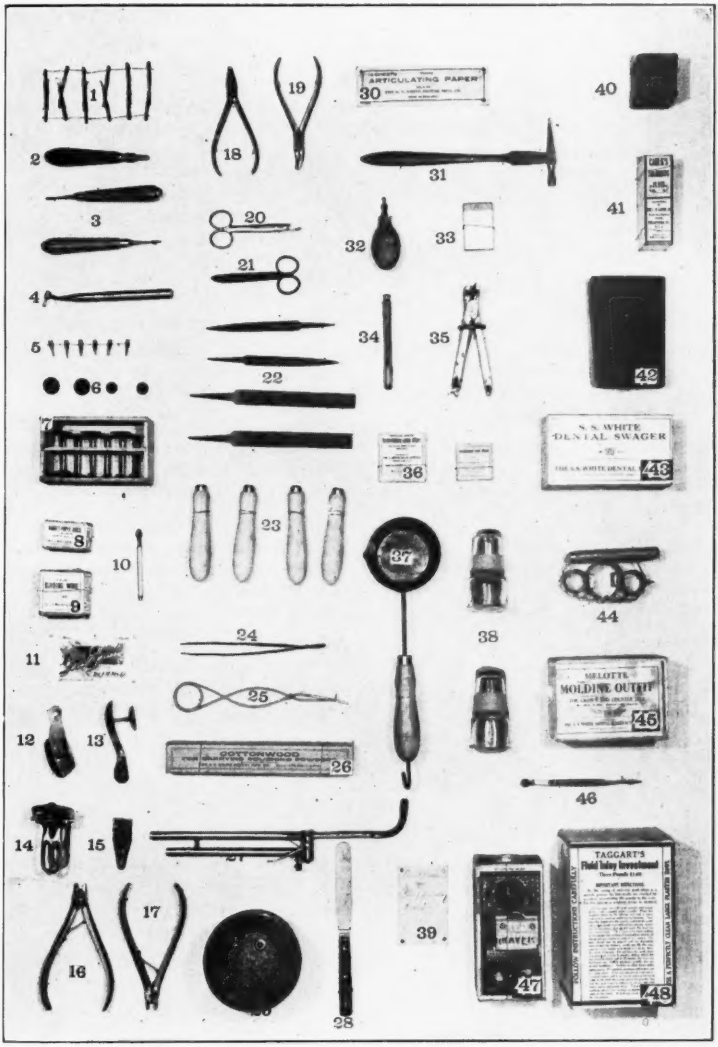

Illustration D—Crown and Bridge Instruments.

*4. 1 Porte Polisher (S. S. W.) and Enamel Cleaver.
5. 6 Enamel Cleavers for Contra Angle Porte Polisher.
6. 1 doz. Vulcarbo Disks, assorted.
7. 1 doz. Leaming Disks, assorted.
8. 1 Box Garnet Paper Disks, ⅞ in.
9. ¼ Pound Iron Binding Wire, 31½ g.
10. 1 Metal Broach Holder.
11. Crown and Bridge Technic Material, including plate, solder, post wire and facings.
12. 1 Universal Impression Tray.
13. 1 Kerr Bite Tray.
14. 1 Crown Articulator.
15. 1 Articulating Plate.
16. 1 Pair Peeso Contouring and Stretching Pliers.
17. 1 Pair Benson Contouring Pliers.
18. 1 Pair Peeso Collar Pliers.
19. 1 Pair Gordon Contouring Pliers.
20. 1 Pair Straight Scissors.
21. 1 Pair Curved Scissors.
22. 4 Files—2 4 in. Half-round, Nos. 3 and 6; 2 6 in. Flat, Nos. 1 and 3.
23. 4 File Handles.
24. 1 Pair Solder Tweezers, long.
25. 1 Pair Crown Pliers.
26. 1 Bundle ¼ in. Cottonwood Sticks.
27. 1 Melotte's Blow Pipe.
*28. 1 Plaster Spatula.
*29. 1 Rubber Plaster Bowl.
*30. 1 Book Articulating Paper.
*31. 1 Riveting Hammer.
32. 1 Disk Moistener.
33. 1 Set Steel Mandrels (for removable work).
34. 1 Pin Vise.
35. 1 Hand Vise.
36. 2 Carborundum Wheels (Fine and Medium grit).
*37. 1 Copper Acid Pan.
38. 2 Office Preparation Bottles.
39. 4 Peeso Root Reamers (Small and Medium 2 R. A.), 2 Plug Finishing Burs, Nos. 231-244.
40. 1 Box Ideal Flux.
41. 1 Box Caulk's Soldering Fluid.
42. 1 Charcoal Block.
43. 1 S. S. W. Swager.
*44. 1 Casting Outfit.
45. 1 Melotte Moldine Outfit.
46. 1 Wax Spatula and Carving Instrument.
47. 1 Box Red Bird Sand.
48. 1 Box Taggart's Inlay Investment.

LIST OF FORCEPS.

(Not illustrated.)

1. No. 286 Bayonet—Universal Upper Anterior and Roots.
2. No. 24—Universal Upper Molar.
3. No. 151 Cryer—Universal Lower Anterior and Roots.
4. No. 215—Universal Lower Molar.
5. No. 104—Universal Upper Molar (3rd particularly).
6. No. 5 Physic—Universal Lower 3rd Molar.
7. No. 222—Universal Lower 3rd Molar.

(Nos. 1, 2, 3 and 4 necessary; 104 optional and either No. 5 Physic or No. 222 optional for lowers.)

(*) Indicates article duplicated on other list.

EXACT METHODS OF LOCATING THE APICAL FORAMEN.

By L. E. Custer, A.M., D.D.S., Dayton, Ohio.

(Read before the Michigan State Dental Society, April 8-12, 1918.)

WITHOUT doubt the most vital question before the dental profession today is, what shall we do with the pulpless tooth? The medical profession is today claiming that the teeth are the cause of all the human ills that cannot be otherwise diagnosed, and some physicians have even gone so far as to advocate the extraction of all such teeth. That pulpless teeth are frequently the cause of systemic disturbances is not questioned for that has been clearly demonstrated time and again, but we cannot agree that they are so in all cases.

The seat of the whole trouble lies at the apical foramen. The problem has been to sterilize and seal this opening in a manner acceptable to nature and if the surgeon has for years been able to seal into the anatomy of a human being a piece of boiler plate the size of a man's hand or suture him up when ten feet or more of silver wire, or if the soldier returns from battle practically water logged with lead bullets, which do no harm, is it not about time that the dentist is able to seal with a foreign material so tiny an opening as the apical foramen in a manner acceptable to nature?

The whole problem involved in saving pulpless teeth and putting them in a condition when they do not become foci of infection, centers in the apical region and as before stated more particularly at the foramen itself. Nowhere in the whole range of human endeavor has there been as much energy spent to patch up a human being as at the tiny apical foramen.

The successful treatment of pulpless teeth depends upon three procedures; first, the complete removal of all pulp tissue; second, the thoro sterilization of the dentin and periapical region and; third, the sealing of the apical foramen under aseptic conditions with a permanent non-irritating material.

The aim of this paper is very small as compared with the entire scope of pulp canal treatment but it is just as important as any other step in the work. Pulp canals have been half filled and overfilled for want of accurate knowledge of root length. The exact location of the apical foramen is not an easy matter even in the straight roots. Heretofore the sense of touch has been relied upon and in some cases the X-ray of a root with a bent wire contained therein has been the most reliable but even this method when used is good only for the tooth rayed. What I have here to present is two new methods of locating the apical foramen. While it is true that the foramen is not always at the extreme apex as Callahan has shown, and there may be more than one foramen to the root, the one method to be presented will meet this condition with precision and the other sufficiently so for all practical purposes. The first is an electrical method of extreme delicacy and accuracy and the other is a technic employing the X-Ray

with specially designed pulp canal root meters. At present I am only using these upon single rooted teeth.

The electrical method is based upon the difference in the electrical conductivity of a dry pulp canal or one filled with a non-conducting liquid, and the conductivity of the tissues just beyond the apical foramen. That is, the pulp canal and contents being either a non-conductor or a poor conductor will contrast very sharply with the normal conductivity of the tissues surrounding apex of the root so that under proper electrical arrangement we can detect the instant a broach for instance passes thru the apical foramen, even much more quickly and accurately than can be told by the patient.

The appliances necessary for this are two or three dry cells, a milammeter such as was used in cataphoresis, a negative electrode to be placed upon the alveolus opposite the root apex and a fine insulated broach attached to the positive wire. The negative electrode is made hair pin shape with rubber polishing cups mounted upon each end filled with cotton saturated with sodium chloride solution as shown in Figure 1.

The tension between the cups is sufficient to hold the appliance in position upon the alveolus. This electrode is placed nearest the root apex rather than the wrist because of the very small voltage required and therefore practically painless. If placed upon the wrist a very much higher voltage is necessary and any fluctuations will be felt. When cataphoresis was so largely used dentists frequently made the mistake of placing the negative electrode upon the wrist rather than upon the cheek and held in place by the rubber dam.

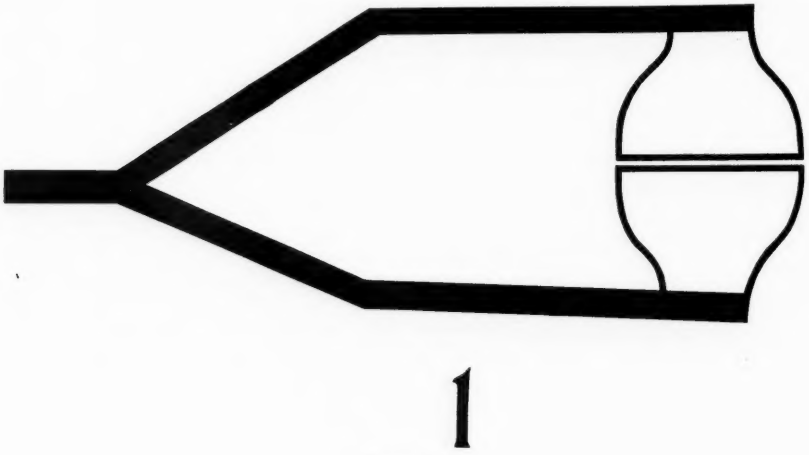

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Figure 1.

When these are connected up the broach is introduced into the pulp canal and slowly worked to and perhaps thru the apical foramen. If the ammeter is watched it will be observed that the index finger will make certain movements which when understood will be a reliable guide as to the depth of penetration of the broach with relation to the apical foramen. If the pulp canal is dry or filled with alcohol there will be no movement of the ammeter finger as the broach

passes up the pulp canal because the alcohol is a non-conductor of electricity but just as the broach reaches the foramen the finger will suddenly move over several points due to the fact that an electrical circuit has been established from the broach thru the moist tissues surrounding the root apex. Normal animal tissues and pus are conductors of electricity.

While the greatest contrast and widest movement of the index finger is observed in a perfectly dry or alcohol filled canal, yet if closely watched, a root canal filled with a fluid conductor such as water or the Dakin solution will show sufficient contrast to be reliable. The index finger will waver when the broach is first introduced into the canal, gradually moving over the scale as the broach approaches the end of the root but just as it emerges from the foramen, the index finger will suddenly move to the right several points. This is due to the fact that the periapical tissues and fluids are better electrical conductors than the pulp canal contents. Bear in mind we have theoretically an hour glass to deal with where the apical foramen represents the hole in the hour glass. The metallic broach is a good conductor which forms half of the glass and the comparatively large amount of conductive tissue between the apex and the sponge electrode is the other half of the hour glass. When the broach makes connection with the periapical tissues it is like puncturing the hole in the hour glass—the sand begins to run.

As previously stated but two or three dry cells are necessary and if the tooth is pulpless there will be no pain altho if three cells are used the patient can indicate the moment the broach emerges from the foramen by reason of a very slight electrical shock but not enough to be really painful.

The second method of getting the root length is one making use of the X-Ray. This is more particularly for use at the time of filling the root and to be filed away for future reference. It was found that out of many hundred teeth measured that the following was the average length in millimeters of the single rooted teeth. An inch is approximately twenty-six millimeters long.

SUPERIOR.

Central.....21 millimeters
Lateral.....22 millimeters
Cuspid.....24 millimeters
Bicuspid.....20 millimeters

The corresponding teeth of the lower jaw averaged one millimeter less in length. We thus see that the various lengths of the single rooted teeth range between twenty and twenty-five millimeters. I therefore devised a set of six steel broaches made with short brass handles thereon placed exactly twenty to twenty-five millimeters from the point of the broach.

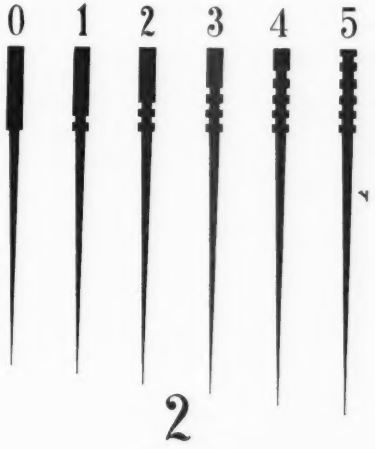

Figure 2.

The handles were grooved with from one to five grooves thereon according to the length of the broach. The shortest with no groove at all indicating that that broach is just twenty millimeters long

from the handle to the point and the broach with five grooves thereon indicates that that broach is just twenty-five millimeters long. The other lengths were arranged between.

The operator selects the broach as near the length of the root as he can judge and inserting it in the tooth till the shoulder of the handle comes against the end of the tooth skiagraphs the tooth with the broach in situ. The grooves on the handle indicates just what length of broach was used. This will then tell just how long that tooth is as compared with the marked broach, which may or may not have reached the apex but he now has by comparison an exact measure of the root for immediate use and for future reference.

While the schemes here presented may seem very elementary we can not deny the fact that the dentist must check up his root canal work. We have guessed long enough. While they apply especially to single rooted teeth we shall from time to time find them applicable to multi-rooted teeth.

Discussion.

E. T. Loeffler, B. S., D. D. S., Ann Arbor, Mich.

The essayist has given you an extremely interesting paper on a most important subject. This particular phase of root canal work, as the title suggests, is so specific in its scope that a lengthy discussion would seem very much out of place. It has been my privilege for some years at the Dental College of the University of Michigan to have charge of the root canal work and therefore consider it a special honor to be asked to discuss Dr. Custer's paper.

"Without doubt"—as the essayist puts it—"the most vital question before the dental profession today is the treatment of pulpless teeth. It is equally true that the teeth are the cause of a large per cent of human ills." No exception can be made to these statements. This part of the subject, however, is not up for discussion.

He further states that, —"The seat of the whole trouble seems to be a problem of thoroly sterilizing and sealing the apical foramen. It is true the general surgeon has for years been able to perform similar operations in various parts of the human anatomy with apparent success so that it does seem about time that the dental surgeon should be able to seal with a foreign material so tiny an opening as the apical foramen of a tooth in a manner acceptable to nature."

I cannot agree with Dr. Custer in regard to the identity or even similarity of these operations. The general surgeon in all his operations has, most invariably, an opportunity to see directly what he is doing. This the dentist is not privileged to do in this particular part of root canal work.

"Root canals have for years been half filled and overfilled for want of accurate knowledge of the root length or the exact location of the apical foramen." I wish most emphatically to make an exception to this statement. Accurate knowledge of root length is an aid and many distinguished operators have for years availed themselves of such information but even so they have come to the conclusion that it requires a vast amount of skill and experience together with a delicate sense of touch to seal a root canal perfectly even in a small per cent of cases.

I am firmly convinced from my own observation and experience and the knowledge gained from others that a delicate sense of touch, and accurate technic and radiograms both before and after the operation play an important part in the solution of this most difficult problem.

We will all admit that it is a comparatively easy task to fill a root canal perfectly when the tooth is outside of the mouth, but to perform this same operation when the root and especially the apical foramen is invisible the problem

is much more complicated. I candidly believe that the technic which Dr. Coolidge advocates in filling root canals is the correct one. He emphasizes the thoro filling of the apical third of the root canal first and especially that portion of the canal passing thru the cementum. The use of a root canal plugger that is made to pass within at least three millimeters of the apical foramen is certainly a very rational procedure for accomplishing this task.

In regard to the ingenious electrical device for locating the apical foramen accurately, I have nothing to offer. The reputation of Dr. Custer is too well known to undertake any such proposition. However, any effort that is being made to solve this root canal problem on a more accurate basis should be encouraged. As a matter of courtesy may I be permitted to quote a few lines from Charles Sumner's famous article on "The Progress of Humanity." "Let us, then, be of good cheer. From the great law of progress we derive at once our duties and our encouragements. Humanity has ever advanced, urged by instincts and necessities implanted by God,—thwarted sometimes by obstacles which have caused it for a time,—a moment only in the immensity of ages,—to deviate from its true line, or seem to retreat, —but still ever onward. Amidst the disappointments which may attend our individual exertions, amidst the universal agitation which now surrounds us, let us recognize this law, confident that whatever is just, whatever is human, whatever is good, whatever is true, according to an immutable ordinance of Providence, in the golden light of the future must prevail."

As to the second method of locating the apical foramen by means of radiograms and a set of specially devised steel broaches of definite lengths there can be no doubt as to its accuracy. For years we have tried to impress upon our students the importance of remembering the average lengths of the different teeth as an aid in filling root canals more accurately and since the advent of the modern X-ray apparatus this means has also been utilized to the fullest extent.

In closing I must say that I enjoyed the reading of Dr. Custer's paper very much and trust that it may be the means of putting the technic of root canal operations on a more scientific basis. I am sorry that more time was not allotted to this paper but at an occasion like this when so many other topics are to be considered the time limit must not be ignored.

Let us all, then, do our bit toward making these meetings more interesting and progressive. Let us give generously of our time and money, if need be, for the solution of some of these perplexing problems. I sincerely believe we should daily consider it our duty and our encouragement to live and to labor, ever mindful of the glorious future. But let us not forget the past. Nor should we be too impatient to witness the fulfillment of our aspirations. But most of all let us not forget the daily increasing discoveries and improvements, even as limited to our own profession, and the daily multiplying efforts many of which are for beneficient purposes only.

PRESENT DAY TENDENCIES IN OPERATIVE DENTISTRY.

By J. M. Walls, D. M. D., St. Paul, Minn.
Professor of Operative Dentistry University of Minnesota.

(Read before the National Dental Association at Its Twenty-first Annual Session, New York City, N. Y., October 23-26, 1917.)

THAT the attitude of the dental profession has undergone a perceptible change during the past twenty-five years is apparent to all observers and a request by your committee for a paper on this subject is evidence of deep interest in final results.

In dealing with this subject the essayist will endeavor to present it in an analytic and somewhat abstract manner; setting forth the conditions, intrinsic and extrinsic as he has seen them, which have been influential in developing new habits or tendencies. In no sense is it the intention to open a discussion of methods except as they affect general principles.

A postulate has been assumed by many, both within and outside the dental profession, that operative dentistry is a fixed science. While it is perhaps true that no branch of curative or preventive measures for controlling disease have so stable, basic principles as operative dentistry, this idea would have presented a closer analogy to the conditions prevailing two or three decades ago.

At that time the knowledge of bacteriology found but limited use, and general pathology played little or no part in dental practice. The study of both these subjects was in its infancy and auto-intoxication as we recognize it today was unknown to the profession. At the earlier period the general usages in vogue by dentists were to repair with fillings, broken or carious teeth, after removing frail and diseased portions only. If pulps were to be removed and root canals filled it was done with no pretense whatsoever at asepsis. In case the teeth were badly decayed, loose or in a degree troublesome, removal was the prompt and accepted remedy. Stains and deposits on the teeth were removed on account of appearance and comfort rather than for the consideration of health.

The limited range in materials and their usages for filling teeth at that time fostered a familiarity with them which made possible greater dexterity in their handling and developed technics of high merit. It was a period demanding less responsibility for the dentist, as the public had not been awakened to the possibilities apparent today. Hence not so much in accomplishment was expected of the dentist; the pressure of environment was less intense. An ability to perform with great expertness the construction of a gold filling with cohesive foils was considered the test of highest efficiency.

While the present theory of decay had become generally accepted, the realization of only partial success by the means used to check it, led to the development of a principle whose aim was for more enduring results. This principle grew to but a limited use, however, until thru the energies of one of our most untiring

workers the theory of extension for prevention began universally to take hold and become fundamental.

It was perhaps due to the industrious search for more facts, the consolidation of scattered thought and the publication of coordinate ideas gained thereby that the name of G. V. Black stood out more prominently than that of any other individual in the dental profession. And perhaps no common usage in our procedures suggests his memory more often than the idea of "Extension for Prevention." The adoption of this principle in operating meant, however, a more extensive involvement of tooth structure and in consequence there has been a frequently heard plea that an adherence to this principle meant such undue waste of tooth structure that failure of the original purpose resulted ultimately thru fracture of the tooth or pulp degeneracy.

No doubt the pendulum of endeavor for the superlative in restoration has in many instances swung far too wide, and much injury been done this principle by an unbalanced application of a scientific truth. This is a common rule of action, however, for we find many extremists whose perceptive powers are outweighed by the imaginative or speculative. Yet it is often thru this means that more expedient methods of employment are discovered.

But the essayist holds no brief for the extremist, who, in the face of possible danger, persists blindly in an ideal.

That there is not a close uniformity of ideas followed thruout the entire profession in this regard is quite evident. In much of the operating where the principles of extension for prevention are persistently followed there is indulgence in too severe intra dental cutting. Frail casps consequently give way under ensuing force, revealing the weakness, not of the principle, but of the method or technic of carrying out the principle.

The essayist expresses the opinion that one of the frequent errors of conscientious operators is failure to fully reckon the forces that are constantly working, and the changes that occur by the wearing down of all, and frequently loss of some teeth, as age advances.

On the other hand, we are constantly brought face to face with failures due to following the opposite method of cavity preparation,—too restricted cutting. The result of this tendency toward ultra-conservation manifesting itself in recurrence of caries proximate to the margins of cavities.

By the original method of making gold fillings, the physical and nervous exhaustion resulting from extensive operations was apparent to both patient and dentist. The introduction of the new method of filling teeth by the inlay process has, however, overcome this to a large degree, and made possible the freer use of the principle of "extension for prevention" without the dangers of tooth fracture that were attendant upon the use of foil. New physical problems presented for solution and the minds of the profession were awakened by the stimulus of search.

The use of silicate cements was also introduced about this time and repeated trials of the new preparations proved their utility beyond inference.

These innovations meant a conversion of the old ideas to conform to new conditions, and their continued application inaugurated broader usages and easier methods of operative procedure.

Due to the ability to accomplish by a short or easy process a result immediately pleasing to both patient and operator, a temptation has arisen to employ these methods in many cases where others would be better adapted for the purpose.

The great danger lies in giving way to that most subtle tendency, ease of action. Influences of an external nature, too, came to bear very strongly on these usages, thru the request of patients to be freed from conspicuous fillings in teeth or long and uncomfortable seances.

The commercial energy has also played a very strong part in influencing den-

tists to the use of the silicious cements thru statements of pseudo-scientific character intended for assimilation as educational food.

It is a consequence of progress that new methods will replace old, and has become axiomatic that activities cannot remain stationary. They must either progress or they will retrogress. It frequently happens, however, that projections made in one direction mean a withdrawal in another direction. This is precisely what has occurred and is occurring today in respect to the development of silicious cement and inlays as filling materials. Up to the period when the use of these two methods developed into possibilities of great advantage to dentist and patient, the process of making tooth restorations depended largely on the use of amalgam and gold foil. That the employment of both of these materials has demonstrated their excellent utility there is no doubt and no one will probably raise a question against the statement that a malleted gold filling well made has no superior in our armamentarium of filling materials.

To carry the argument still further toward a conclusion, let it be stated that there are places for the use of gold foil, amalgam and the baked porcelain inlay that cannot be filled by other usages and materials at present available. For obvious reasons comparison would arise chiefly between the uses of gold foil and the inlay. In order to be fully successful with the former, it is necessary that such skill in its handling be acquired as to make its use easy. One must have perfect confidence in his ability to accomplish what he sets out to do. And not only must an assurance in handling gold foil be fully acquired to give comfort to the user, but skill must be retained by at least occasional, if not by frequent practice.

Failure in a method, after limited trials, breaks the will power of the average individual and encourages the adoption of other measures. The want of skill in manipulating gold foil is a prime reason why it is not used more extensively and, without common usage, failure to adequately appreciate its virtues follows.

No argument could at the present time be sustained in any large group of dentists why the inlay should not be extensively used and even supplant in a large measure the use of amalgam and gold foil but it seems quite evident that there is a wilful disregard of the advantages of these methods. By simple deduction it is easy to understand why the older methods are giving way to the newer ones and in places where they should stand paramount.

Again the suggestion of inertia, the desire to acquire by easy methods, comes into play and we find ourselves traveling along the lines of least resistance. It is worthy of note that indulgence in a specific line of energy tends toward continuing along a limited course, demonstrating the claim that human endeavor does not operate so much by reason as by habit.

So it is proving in the use of the inlay; custom is establishing the mode of operative procedure and inertia thwarting versatility of action.

It is not alone in mechanical lines that new ideas have changed the course of thought and tendencies of procedure. Perhaps nothing has arisen in the history of dentistry that has so awakened the minds of the profession as the discovery by radiography of periodental infection where teeth and surrounding tissue were by previous measures judged healthy. For this we are indebted probably more to extrinsic than to intrinsic influences. And the medical profession, having once grasped the idea for diagnostic purposes and etiological explanations, seized upon it with so much firmness that whether we willed or not, we were compelled to respect its possibilities.

The observations and investigations carried on within our own ranks have, thru their findings, resulted in far-reaching problems and we have much to be

proud of in the expressions of such energy and gratifying are the rewards for the efforts of these dentists.

Thru the altered opinions resulting form these discoveries of migration and habitat of infection, operative dentistry is summoned to exert its maximum force. Upon this branch of practice more than any other, whatever the view may be for handling teeth with exposed pulps or infected roots, rests the responsibility for impairment of health or loss of teeth. Primarily the function of such work is prevention of disease to such an extent as will overcome infection of the periodental structures.

This means systematic care of the teeth and mouth from early childhood to advanced life by prophylaxis, scientifically made fillings and instruction of patients as to habits, diet and care of mouth. And it means that the profession must arrive at a sense of realization that slipshod, easily performed, quickly done methods will not bring results, but only a reflection on the scientific attainment of the advanced members of the profession.

Where the treatment of pulps or roots of teeth is required a feverish excitement takes hold of the profession for we know that periapical infection is almost invariably preceded by pulp disintegration or removal. Our present idea for the successful methods of treatment of root canals are inductive in character only and induction is always uncertain. More positive conclusions regarding these methods must be arrived at before we can set down scientific facts for absolute dependence.

This statement may receive sharp contradiction in the minds of some, for there are frequent suggestions of 100% successes following a rare combination of skill and method in treating and filling roots. But we must not be led to the formation of premature judgments by exciting theories.

The necessity in root canal treatments for that technical care which insures against the introduction of foreign infection is exacting of the dentist a thought and energy which is novel and which is exerting a most wholesome influence in the conduct of his other procedures. And, until more definite conclusions can be arrived at regarding this work, moderation in ideas would seem advisable.

The introduction of new methods and ideas as noted have brought about changes in the attitude of dentists toward their work and the broadening fields have caused specialization to develop at a rapid pace. Such changes have stimulated mental energy and investigation. They have also brought us in closer contact with the medical profession and many of the attitudes of that profession have been absorbed by us. They have led to new impulses, most of which are commendable, but some are deplorable and a stigma on the profession, and no matter in what proportion they exist, it has had a perceptible neutralizing effect upon the glory of achievement.

The concentration of energy upon individual branches of practice has shown a growing tendency and should result in higher achievement in skill and thought. It requires time, however, to find a proper sphere of action for the different specialists so that the wheels of endeavor will not at one time grind too finely and at others release unbroken, kernels of value.

A proper coordination of the specialized subjects will be required and a universal sense of appreciation by specialists of the limits of their field will be necessary before the machinery can run smoothly and to the advantage of the public.

As concrete examples of these thoughts, the following might be cited as ideas that have a vulnerable effect on operative dentistry. This branch, having the distinct requirements of arresting caries and preventing periapical infection, calls into operation three distinct units

of procedure comprising prophylactic measures independent of opturator features, opturation or restoration by fillings where caries or intra-dental spaces have occurred and treatment against sepsis, within or contiguous to root canals.

The three branches are inseparable and interdependent upon each other so that specialization in any one of them must include a coordinated means for proper attention to the others.

In consideration of the second idea, that of restriction of one's work to branches within his ability or willingness to properly handle, instances are commonly revealed of specialists who have no ambition for, or take no pleasure in, the mechanical technic of operative dentistry, but who are simply filling in, as it were, with this class of work making of it a side issue, or turning it over to one of meagre experience and slight ability with the implication that the lesser light can give it the attention necessary.

Such impulses seizing the profession have their most unfavorable effect by detracting from the fundamental ideas and principles which have formed a basis of operations.

These unfavorable tendencies might be largely overcome if, for example, one specializing in prophylaxis or the treatment of pyorrhea will demand of himself or others upon whom he may depend, operations in filling or crowning teeth that comply with the highest ideals in these branches. Why, for instance, should such a specialist charge himself with great responsibility in his own branch and fail to recognize the principles involved in proper extension of cavity outlines, perfect restoration of tooth form, including smoothly contoured surfaces, proper contacts between teeth, flawless margins, a conception of the meaning of the various ridges, casps and grooves, and a clear appreciation of the movements of the food during the process of mastication. Failing in this, the work of his own hands is negligible.

It is quite true, at the present time at least, that operative dentistry is less spectacular, less impressive than some other branches. This, in part, is due to its common usage, having become habituated to it, it is overlooked just as a star of the first magnitude loses its entity by the sudden flash of a comet. So the spectacular in professional effort wins the plaudit over the staid and knowingly dependable.

In consequence of this, there has been a tendency of dentists to add one stellar attraction to their accomplishments for its psychologic effect and a need for specialization has been outrun by a desire for attention.

If one feels that the inglorious work of general operative procedures is not tonic enough, nor startling or spectacular enough, or has not sufficient of the mystic about it to fully impress those coming in contact with him, or if his tastes merely incline in another direction, let the selection of a specialty be chosen with a passion to do it justice, but allow the other branches to be handled with equal respect for their importance.

There is but one other factor for influence that desire calls to bring to your attention. One that is unpleasant to deal with and yet of evident power in marking tendencies of procedure, not alone in the operative field to be sure, but that branch is affected with other branches of the profession.

A new spirit of commercialism has sprung up in some localities that threatens the respect of the profession as an ethical body. There is evidence of it in conversations with individuals or groups, editorials and contributions in dental journals and striking symposiums on business principles sent out broadcast by dealers and manufacturers of merchandise used by dentists. These persistent, ulterior suggestions of commercialism foisted upon the profession

effects far reaching changes in its attitude toward idealisms and stultifies its conscience.

The varied influences that have been borne to the profession seem to have actuated two-fold impulses enabling us to recognize thru the introduction of the cast gold inlay the following conditions:

First. An opportunity to fulfill, in a larger degree, our ideas of extending cavity outlines to safe limits for permanency of work and, at the same time, conserving the strength of the tooth.

Second. The possibility, previously difficult, but now most simple, of outlining occlusial portions of restorations in metals to conform in full measure to the demands of utility as exemplified in nature.

Third. A protection to the pulp from irritation by the inter-position of cement.

Fourth. A relief from strain to patient and operator by lessened concentration in cases of large restorations.

Fifth. The reduction in the numbers of crowns by the broad application of the inlay.

Notwithstanding these advantages, a marked disadvantage has appeared thru the tendency, and a very prevalent one, of using the inlay where one of the other methods would have given superior results and often at a considerable saving of time.

It also seems to have produced to some extent shiftlessness in procedures.

As to the use of the silicate cement, beyond the advantages that it possesses, there is the tendency toward satisfaction with temporary rather than permanent measures and the introduction of the habit of lassitude.

The wide sweep in education to reduce caries by prophylactic measures produced some benefit but it required a blow severe in character to arouse people from their stupor of negligence and compel them to recognize the danger from oral infection due to indifference.

The greater possibilities have engendered a keener sense of responsibility and increased the self-respect of dentists. They have aroused more mental activity and have broadened the horizon of dentistry thru increased demands, altho the standards of dexterity and technical skill seem not to have been bettered except in cases of isolated groups.

A decided tendency toward specialization has taken place and presents many advantages, altho too close specialization tends to narrow one's perspective.

As a final thought, there has been an inclination on the part of many to take advantage of the laity, frightened by the information acquired regarding infection. Never before has the mind of the public been so receptive of the offices of the dentist and so anxious to secure his services for the maintenance of health or so willing to reward him in a material way and by appreciation. Never before has the opportunity of dentists to serve the public been so great as at the present time. And it rests with them whether or not, by the maintenance of high standards, an assumption of larger responsibilities and honest service, the respect, appreciation and full confidence of the public will be maintained.

Discussion.

A. H. Hipple, Omaha, Neb.

I agree with the essayist that while there may be some tendencies in operative dentistry that are of doubtful advantage, in the main the tendencies are unquestionably upward.

There has been a complete change within the past few years in our ideas and our ideals as dentists. A few years ago we were chiefly concerned over physical problems: today our chief concern is in regard to vital problems. If you doubt that statement compare the program of this meeting with the programs of national meetings held in former years. We are still interested in the restoration of lost dental tissue, and of lost dental organs, we are still en-

gaged in the work of conservation, but we are more concerned today regarding the conservation of health than we are regarding the conservation of teeth. We do not know very much yet as to the relationship between dental conditions and systemic conditions, but we know something about it and we are anxious to learn more. There never was a time in the history of dentistry when dentists would spend as much time and money and travel as far to learn things as they will today. Dentists have had their vision enlarged. The dentistry of the past has been weighed in the balance and found wanting and we all realize it. In the past we have done the things we ought not to have done, and we have left undone the things we should have done, and we are all sorry for it. Within the past few years there have been times when our responsibilities have weighed so heavily upon some of us that we felt like giving up the practice of dentistry entirely. In his Special Dental Pathology Dr. G. V. Black, speaking of his own efforts to combat pyorrhea, says: "I have since had reason to believe that I went much too far in my effort to cure. Much too large a percentage of those people are dead." Reflections of that character have a sobering influence, and we have all been doing more or less thinking along those lines. One result of our thinking has been a desire for knowledge, real definite knowledge, knowledge that will enable us to do better and safer dentistry, and that desire, in my opinion, is the most hopeful tendency in dentistry today.

The essayist refers to the tendency to substitute the gold inlay for the malleted gold filling, and silicate cements for baked porcelain fillings, as due partly to their merits, partly to a lack of skill on the part of many dentists, and partly to a desire on the part of patients for less trying operations, and more esthetic results. I agree with him in his analysis and in his conclusions. I agree with him that it is unfortunate that dentists in selecting filling materials should be guided by what is easiest, rather than by what is best. I deplore any lowering of standards. But, as I look over this country, as I study the results of examinations of mouths of school children, as I observe conditions that exist among army recruits, as I consider the foci of infection that we all know exist in the mouths of a very large percentage of our population, and interpret them in the light of hospital records and reports, I am impressed with the idea that in the very near future we will face the necessity of doing very much more work than we are now doing, and that we may be forced to adopt time-saving operations at the expense of some of our ideals That is exactly what is being done at this very time in caring for the mouths of army recruits. The instructions are to fill occlusal cavities with amalgam, and proximal cavities with cement. That is not ideal dentistry by any means, but in the opinion of men in authority it is the best that can be done under the circumstances. It is better to fill all the cavities that need filling with cement and amalgam, than to spend the same amount of time in filling ten per cent of the cavities with inlays or malleted gold fillings, and leave the rest unfilled. There are not enough dentists in the country today to do the work of the army and our civilian population that is imperitively demanded. For a few years as least, the shortage is bound to become more acute. The normal output of the dental colleges is being reduced, partly because of the adoption of the four year course, and partly because of war conditions. In time the situation will be remedied and the supply of dentists will equal the demand, but in the meantime we will have to solve practical problems in a practical way.

Alfred R. Starr, New York City, N. Y.

The essayist has called attention to the danger of infection thru lack of proper aseptic procedure in treating de-

vitalized teeth. When I began the practice of dentistry but little was known of antisepsis and still less of asepsis. The dentist's therapeutic armamentarium consisted chiefly of arsenic trioxide, clove oil, phenol and creosote, and even if blindfolded you could realize your presence in a dental office thru olfactory evidence of the last named drug in your surroundings. You could almost recognize a dentist on the street in the same manner. The so-called germ theory of disease and the scientific application of the antiseptic treatment of wounds had their origin but a short time before this period. Dentistry had not then fully appreciated the value of antisepsis or commenced to appreciate the value of asepsis in dental operations. At that time it was an established fact that opening into the pulp chamber of a devitalized tooth almost invariably resulted in an alveolar abscess. We avoided opening into such a tooth unless the sufferings of the patient absolutely indicated such a procedure, and then operated without any definite aseptic precautions. An abscessed tooth, if a bicuspid or molar, was usually doomed to extraction. The development of effective aseptic methods has marked a great step in advance and is one of the most important of the present-day methods. Antiseptic methods have also received their share of attention and great progress has been made in their improvement. The Buckley method of treating putrescent pulps is in my estimation a noteworthy example of the progress made in this direction. The modern methods of treatment of wounds as carried out during the present war has almost revolutionized the practice of surgery and we, as dental and oral surgeons, should acquire a knowledge of and endeavor to apply these new methods to the practice of our profession. It is perhaps impossible to obtain perfect and prolonged sterilization of a wound in the mouth, but recent reports indicate that the Carrel-Dakin solution may be of considerable value in mouth surgery.

Another great advance in the science and art of operative dentistry was the doctrine of "extension for prevention" as promulgated by the late Professor G. V. Black. Some may have recognized the merit of, and practiced, this method before it was brought to the notice of the profession by Professor Black, but Professor Black certainly deserves the credit for having worked out the principles involved and for clearly setting forth those principles for the edification of the profession. I believe, with the essayist, that the method has, by some practitioners, been carried to extremes as has also the counter-method of conservatism, but there is no question as to its great value, if properly applied, in preventing recurrence of caries. Its chief danger lies in its improper or indiscriminate use. Dr. Black has well said that "extension for prevention" does not mean deep cutting or great weakening of the teeth. That statement is correct but on the other hand it does sometimes mean *wide* cutting and the exposure of a large area of normal dentin with the necessarily greater danger to the pulp. This alone, aside from the other disadvantages, should deter us from carrying out in all cases the full measure of the principles involved. We should be especially careful in the case of a young subject. I have so often expressed my views in regard to the necessity for conservation of the tooth-pulp that I am not going to dwell on that subject now. It seems to me that in view of the many recent statements concerning the dangers arising from infected pulps and periapical abscesses, any argument in favor of prophylaxis thru the conservation of the dental pulp should be unnecessary.

The question of proper occlusion is, as stated by the essayist, a very important one, not only from the standpoint of the proper anchorage of fillings and inlays, but also in connection with the treatment of Pyorrhea or of a tendency

to displacement of the teeth. I can fully endorse the statement that the use of an inlay makes possible the more free use of the principles of "extension for prevention."

With an inlay there is less danger of fracturing thin walls, less danger to the pulp because of the intervening cement, better opportunity to restore normal occlusion, contour and contact and a greater saving of time and stress for both patient and operator. I desire also to express my approval of the remarks of the essayist concerning the comparative values of silicate cements and porcelain inlays and of gold inlays as compared with gold foil fillings or amalgams. Each material has its particular uses and advantages and no one of them can be depended upon to the exclusion of the other. In my estimation both the silicate cements and gold inlays are used too frequently and porcelain inlays and gold foil fillings too little. Eclecticism seems to be the proper practice in the selection of a material for obturation and we should not allow mercenary motives or ease of manipulation to bias our judgment in this selection, where durability and other factors of value to the patient are involved. The Roentgen Ray has probably done more for dentistry than any other modern scientific discovery. Many hidden dangers have been brought to light by this exceedingly useful method of diagnosis and many teeth, which before the application of this method would have been doomed to extraction, can now be saved. Its therapeutic value is still somewhat doubtful. Much remains to be learned in regard to the use of this method so far as the interpretation of the pictures is concerned. It is often impossible to make a correct diagnosis until we have taken pictures at different angles, have been informed as to the clinical history of the case and have used other physical means of diagnosis.

The use of wires in the pulp canals are often of great value in assisting us to arrive at a correct diagnosis by this method. I do not know who was the first to suggest the use of the wires for this purpose but I do know that I am on record as having demonstrated their usefulness at a meeting of the First District Dental Society held on March 14th, 1905. (See Dental Cosmos, Vol. XLVIII, page 343). Medical men are prone to place a little too much value on the X-ray as a means of diagnosis and often insist on the removal of a tooth which could and should be saved. There is no question as to the danger of general infection from foci of infection about the teeth and the dentist should be alive to his responsibility in these cases, but he should also be aware of his duty to endeavor to save those teeth where the foci of infection can be quickly and effectually eliminated and the patient's masticatory apparatus preserved in tact. The essayist sounds the proper note when he indicates that the function of our work is prevention of disease to such extent as will obviate the infection of the peridental structures. Prophylaxis, including the proper care of the mouth, the correct filling of cavities, the restoration of proper occlusion and contact where necessary, the removal of deposits or any removable external sources of irritation, the extraction of much loosened teeth or broken down roots and the elimination of all possible sources of general infection must be the aim and object of the dental practitioner and he should strive in every case to fulfill these conditions to the best of his ability.

Specialization comes to our aid in the fulfillment of the above conditions. The tendency to specialize seems to be on the increase and perhaps this is beneficial, but there is still plenty of room and plenty of work for the old-fashioned general practitioner. Not all of our patients can afford the "luxury" of a specialist for each one of his ailments and the studious, conscientious and well informed general practitioner can usually meet the necessities of the case. Even

our specialists are not infallible. The essayist is evidently indulging in a sense of humor when he says—"There are frequent suggestions of 100% successes following a rare combination of skill and method in treating and filling roots." I agree with him as to the "suggestions" and in his veiled hint as to the reliability of those suggestions. If there is any human being for whom the divine attribute of infallibility can be justly claimed, I am quite sure in my own mind that he is not a member of the dental profession.

J. J. Travis, Ann Arbor, Mich.

I wish to voice my appreciation of Dr. Wall's paper, particularly because of its conservatism. It is very broad, very safe and sane, and very conservative. It is so almost to a fault, in some regards. While we adhere to the virtues of the gold filling and of the amalgam filling, yet we have learned by experience, the failures of amalgam, owing to structural changes in form that always occur. While we know of the virtues of the gold filling, and of the large numbers of fillings that have preserved teeth for many years, at the same time we know it has produced many failures, and I think the essayist attempted to bring out this point,—that we were liable to take up the more simple and easier methods pushing aside the more difficult methods of the manipulation of gold foil. The gold foil filling is at least a very difficult method, and to master its technic requires a fine order of skill. But I wish to make a little protest against the statement—if I have interpreted it correctly,—the gold inlay will save many teeth that the gold filling would fail to save, particularly in cases where the restoration is a larger one. And the fact that it has been spoken of as an easy method is the thing I wish to make my protest against. The men who attempt to do the gold inlay because it is an easy method, are making a mistake. It is not easy. It is one of the hardest pieces of work it is possible to turn our hands to, and requires a greater knowledge of the procedure than does the malleted gold filling. You must be familiar with the action of your wax and the volume changes. You must be familiar with the temperature at which the investment is to be made; with the consistency of the investment and the volume changes (shrinkage or expansion) that would result from the different methods of handling it. You must be familiar with the percentage of the flare of the wall because of the shrinkage of the gold, and when you attempt to have the shrinkage of the gold counterbalanced by the expansion of the wax, or the expansion of the investment, the temperature at which you shoot your gold into the investment and the difference in shape of cavity preparation—which determines the temperature at which you should cast,—these things must all be known and worked out scientifically.

No man can get ideal results with the gold inlay and call it an easy process. It is easier on the patient, and that is an advantage. It is somewhat easier on the nervous system of the operator, because he is not confined at the operation so long at any time. To do a really careful operation in filling a tooth with a cemented gold inlay, is one of the most difficult operations we have to perform, and the sooner the profession gets rid of the idea that this is an easy operation the sooner we will get to making gold inlays that will present to us the margin of the malleted gold filling, not only on exposed and accessible surfaces, but at the cervical margin.

Dr. J. M. Prime, Omaha, Neb.

Mr. Chairman: I did not think I would have anything to say when I come into this section, but I find myself as usual, faced with things compelling me to speak. This subject has been discussed,—papers have been read, and it has been vitally interesting to all of us.

I did not get to hear either of the essayists, but I have heard those who have discussed the papers. I am led to this conclusion; that if we succeed in performing a good operation, whether it be in amalgam, in the cast gold inlay, in the porcelain inlay or in the malleted gold filling, success comes only at the price of eternal vigilence. A man who can make a good cast inlay will make a good foil operation, and the man making a good foil operation can learn to make a good porcelain inlay. Only the careful, the studious, the honest and the skilful will succeed in either. I am glad to see the tendency drifting back to those things proven by time to be superior. I am glad to hear mentioned today the excellency of the porcelain inlay. Where indicated, it is the peer of all, and I am happy to have heard those discussing the paper say the gold foil filling still is favored by them, and gentlemen, the time and skill employed to produce a good gold inlay will produce, in the same man's hands, a better operation in gold foil, in the majority of cases.

What do we seek to accomplish in the operation of filling a tooth? Is not the primary object to stop the progress of decay toward the dental pulp, and save its life? To preserve it in its health? To immunize the tooth surfaces? To restore the tooth to its original form and function, and to protect the investing tissues? If this then is our duty, I ask what material has time proven to be first in accomplishing these results? With the rubber dam in place, the cavity is prepared under dry conditions, with less pain, and we know we secure a superior cavity. We know when we fill that cavity with gold foil, fresh from the flame, we are using a sterile material, and we have had demonstrated for forty years the immunity of those fillings by men who have gone before us. When properly performed, these operations have stood the test of time, first in order of all the filling materials. I plead with you, do not let the meteor going thru the heavens hide from view the stars of the first magnitude. Do not let the inlay draw your attention away from the technic of the gold foil, because in the average number of cases I believe we know and can prove that gold foil can be not only better adapted to those cavity walls, but quicker. It is foolishness to discuss which is the quicker. That is not what we are after. Which is the better? What is the material with which we may use to our great advantage the elasticity of the dentin, and place in the cavity a filling which the dentin will grip continuously and hold there secure against moisture and bacterial invasion? Only one material—gold foil. Somebody said it was so difficult to use. I challenge that statement. It is difficult because we have not studied it: it is difficult because we do not comprehend the facts entering into the operation. Five or six things are necessary, we are told, in securing a good inlay: temperature, change in volume of materials used, etc., etc. The operator in gold foil may secure absolute adaptation of the material to sterile cavity walls and eliminate all chances, in one operation. Where gold foil is indicated let us use it honestly, carefully and scientifically. It will then demonstrate its wonderful possibilities.

If you were placed upon the witness stand to testify which were the better filling, I think you would be asked how long you have used gold inlays. The reply might be, six or eight years. You would be asked how long you had used gold foil, or how long has gold foil been used by the older successful operators? The reply would be forty or fifty years. Do you think it fair to try to establish facts on eight or ten years' experience for or against the inlay? We have not sufficient data to determine what the inlay may do. What we do have indicates to us that it is far inferior to the goil foil operation. And in view of the wonderful value of dental pulp, as has been demonstrated to us so fully re-

cently, let us plead for the more careful and more conscientious use of a filling material that will stop permanently the progress of decay toward the valuable dental pulp. We are learning God made no mistake in placing the dental pulp in the tooth, and when the dentist substitutes a filling, he gets into trouble. You say the pulp is not necessary in a tooth, and wonder why it is there. The dental pulp has a function and its preservation is necessary. Let us employ those principles in operative procedure that will best protect the dental pulp and best immunize the surfaces of the tooth, restore its form and best protect the investing tissues. Gold foil properly manipulated and properly handled, possesses superior qualities over all the others. The compressibility of the dentin: the separating of the teeth as you place the filling, allowing of a better restoration of the contact point and form of the tooth than when wax (for the gold inlay) is used. "Better?"—you say. Yes, better! When the patient bites into the wax to secure the occlusion, is an anatomical occlusion secured? No, you have simply registered *one* position of the mandible. A correct occlusion is secured only with *a working bite,* that is, the unconscious biting is shown on the filling and by touching these worn facets with a stone from time to time a very nearly perfect articulation is secured.

Dr. J. J. Wright, Milwaukee, Wis.

Like the gentleman preceding me, I did not expect to be long present in this Section, but the gentleman has made his argument so insistent I cannot conscientiously allow it to pass. He dwells largely on the matter of saving the pulp, forgetting that a very large restoration in gold foil is one of the very hardest things on the dental pulp that it may be subjected to. There are other elements in favor of the gold inlay, and there are two of especial importance. The first one is this: a gold operator who constantly applies himself to that class of work, very often trying to get a direct view of the cavity, twists his body into such a shape that his physical functions may not be properly performed, and thus a profession of unhealthy men is created. Every time I attend a Dental Convention these days I note how much healthier and better the present condition of dentists is. They are not continuously at that procedure of pounding in gold as was true fifteen or twenty years ago. Then they were pale and anaemic. The work of pounding in gold foil fillings subjected them to a great physical test. I think that is one very important thing, gentlemen.

A second matter of importance, is the welfare of the patient. The making of large gold foil restorations, especially in the molar teeth, subjects many of your neurotic patients to a strain from which they may not recover in a long time, and that argument alone should often cause you to decide in favor of the gold inlay.

There are many other things favoring the gold inlay in preference to large restorations in gold foil. The smaller restorations in foil I like, and use them every day, but for larger ones I think the gold inlay has come to stay. It has proven itself just as worthy. Many of you are expert gold foil operators, and your restorations will stand from one decade to another; but the average gold foil filling has "blue margins" around it. You do not get those when you have the cement lining, as in the gold inlay, and in my judgment that is a protection to the pulp and is unequalled in a large gold foil filling.

Dr. J. Melville, Thompson, Detroit.

Like Doctors Wright and Prime, who have just moved us with eloquence in favor of the gold foil filling, I did not hear Dr. Walls' paper, but I think from the discussions read that it had to do with the giving of the very best service to the patient at the time he presents for work. I am not so very old, but I re-

member our beloved old Dr. J. Foster Flagg, who belonged to the new Departure Corps so many years ago, whose slogan was, "That in proportion as a tooth needed saving, gold was the poorest thing to put into it." I was a disciple of his in Philadelphia, and in many respects have not changed. I have put in some creditable gold foil fillings, and I take off my hat to them frequently for having been in use the better part of twenty years. But when it comes to saying a gold inlay has no place alongside a gold foil filling, I take issue with the gentleman. I know Dr. Travis, and know he is a scientific man and makes good gold inlays. I think many of us have yet to have our eyes opened to the value of the indirect method of filling teeth with gold inlays. I can show Dr. Prime that I can make as good an occlusion with the indirect method gold inlay as he can make a filling with his mallet, and with more ease to the patient and to myself.

As to the value of the X-ray in dentistry, I think at the present time Dentists are scared stiff by the reports the medical men are making over some of our work. I am perfectly willing to admit there are many cases in which we may be violently criticised, but there are others where care should be observed. The thing for us to do is to investigate all cases. We are showing some cases of poorly filled roots, with deep shadows, showing "areas of infection," etc., which have cleared up after the roots have been perfectly filled. I am waiting for the wise man to tell us whether we have complete restoration and removal of infection or not. I have seen them in my practice, and in that of Dr. LeGrow, of Detroit, also. The time to tell the Medical Profession where to "head in" is coming very soon I think. A root may be filled and properly sterilized. We should do more instrumentation and less medication, and I think as we do so we will have a success that we know not of at this time.

Dr. Prime: I see I am misunderstood. I did not mean to say, and do not believe I did say the cast gold inlay has no place in dentistry. We must use and develop the best possible technic for making it. I agree with the Doctor, that large gold foil operations may be a menace to the dental pulp. I would like to have him admit that large inlays may likewise be a menace to the pulp. When any filling material encroaches upon the dental pulp we are in danger, and some large operations should not be made in gold foil for that very reason, and many should not have an inlay for the reason that the life of the pulp is yet a question. If the pulp is not exposed nor in any way irritated, I consider its chances for life better under the foil that I do under the inlay. When the cavity is infected by the saliva and where the wall of dentin is thin between the cavity and the pulp, making the dentinal fibrils very short, I feel sure we may be endangering the pulp when we press the wax into the cavity forcing the infection into the short tubules. I believe there is a place for the gold inlay, also a wide place for the porcelain inlay. I believe there is a place for the amalgam filling and I firmly believe there is a wide and neglected use of gold foil.

Dr. Travis, Ann Arbor: Dr. G. V. Black gave us a stereopticon lecture in Detroit and related that a patient of his fell into the hands of a conferere, who was proud of Dr. Black's work, done some years ago. The patient stated that Dr. Black had put the work in about thirty years ago, and at that time he put in twenty fillings for him The dentist said, "Yes, that is a very beautiful filling, but where are the other nineteen fillings?" They were gone. Dr. Prime, in his discussion, told of putting sterile pieces of gold into the cavity. That is true, but if you put one hundred or two hundred pieces of gold into the cavity you must be absolutely certain and not bridge them over and leave little molecular spaces where

bacteria can get their work in. If you make a very few of these bridges in a filling composed of 200 pieces, you have two hundred opportunities for failure, whereas in a perfectly cemented gold inlay such a thing is not possible.

When you are told you can not get contour in the gold inlay, that is a mistake. You do not need to get the contact with the wax itself. That is done by adding a little solder at the proper place. The admission has been made that with the malleted gold filling it is necessary, even tho the patient is exhausted by the long operation, to get extreme separation for the purpose of polishing the filling. That is the hardest thing in malleted gold fillings. I have put in hundreds of them, but when you say you cannot get those same results in the gold inlay and with less tedium to the patient, I think you are mistaken. When a man thinks you can not get equally as good occlusal surfaces with the inlay as with the malleted gold filling, I think he is equally at fault. When the patient bites on the wax, if you instruct him at that time (with the lower areas of the wax chilled) to bite down, and give the normal excursions of the jaw, you can carve and get your sulci and get an absolutely accurate occlusal surface, which you do not get in the malleted gold fillings. I only wanted to make a few of those little corrections.

Fred E. Hart, San Francisco: I wish to agree with what Dr. Prime has said about the foil filling.

Regarding the death of pulps under foil fillings and the merits of the inlay in that particular, it occurs to me that the foil has the better of the argument.

The danger in many cases comes from unnecessarily deep cutting.

Protection can be afforded the pulp before placing foil fillings as well, if not better, than is accomplished by the cementing of an inlay.

The pulps in many teeth are perhaps infected during the interval of time between the operation of preparing the cavity and setting the inlay, by the saliva having access to the dentin, being pumped into the open ends of the dental tubuli by the force of mastication against temporary stopping or gutta percha so placed that it does not perfectly seal the cavity.

A filling that can be placed in a cavity, immediately after its preparation, in contact with freshly cut dentin, that has not been contaminated by saliva, must merit commendation as an aid to pulp conservation.

Dr. Prime: This discussion could be made long and tedious, and turned into a joke if carried too far, but the gentleman has corrected some mistakes. He gave us his opinion, for which I thank him. I am giving you my opinions,—that is all. Both of us might be wrong. He has not established the facts. Neither may I, and I will not attempt to. He says he can perfectly seal an inlay in the tooth with cement. We had a root canal specialist at our state meeting last year. He cautioned us not to seal our treatment in the canal with cement. We asked why. He answered because moisture travels thru the cement. I wonder how you will seal an inlay with a material thru which moisture travels in a few hours? They say they can demonstrate it. I have not. Regarding dentists being so emaciated, pale, etc., I have worked in gold foil almost exclusively for ten years, am forty-five years of age and do not wear any glasses. "But one swallow does not make a spring." It only proves a man may survive and make gold foil operations every day. I am one fellow who has done it. My patients do not object to gold foil operations. Many of them sleep while the work is being done. My patients are as high class citizens as anybody's patients, and they believe me when I tell them that gold foil is the superior operation.

Operative dentistry is for the prevention of those troubles about which Doctor Rosenow spoke a while ago in this room. Dental Prophylaxis and Preventive Den-

tistry is the first consideration. It is our duty to prevent these difficulties, and an operator who saves the dental pulp and the tooth is to the man who replaces the tooth with a bridge, very much as the Doctor who saves the man's foot to the fellow who makes the artificial limb. I respect you gentlemen when you save the dental pulp and preserve the tooth in its health. I respect the prophylactic man who saves the teeth from peridental disease. This is a serious thing. I am very much in earnest, but am only giving you my opinion.

Dr. J. Alden Mills, New York: I am proud of dentistry. It has come from the barber shop to a Barber—and he is attending the National Dental Association! The progress of dentistry should inspire every man with zeal,—not beyond wisdom,—with real zeal. I have no controversy with anybody as to how they do these things, if they only do them. I tell you, men, dentistry is a big thing. The progress we have made, as a medical man has said here, is greater in the past seventy-five years than their profession has made in two thousand. Atkinson, of New York City, made this prediction, that the time will come when the tip top blue blossom will rest on the Dental Profession. I thank God I am a dentist. I had to have my teeth broken out at twelve years of age to find out my mission in life. My teeth were broken by falling on the ice. Today we would put Richmond crowns on them. I whittled out some wooden teeth and put them in there during school time, and got my ears boxed for it. My folks wanted to make me a merchant. My father got me a place in a store. I learned the carpenter's trade, and in '52 these teeth were gone and some of the girls said: "Mills don't look as he ought to." So I had the teeth put in artificially. Some of my friends said, "Why not be a dentist?" I took it under consideration, and the result you all know.

A dentist over in England said that Mills, over in America, if he ever dies, he will die of Riggs disease! I had the good fortune to have my teeth treated by Dr. Riggs, and here I am, alive at eighty-seven years.

Dr. J. M. Walls: The discussers of my paper were very kind to me, and I wish to express my appreciation to them for the excellent discussions they presented to the organization. It was not my intention to follow middle ground, and I knew that if it pleased the assembly before which this paper was read, that the technical side of the question be discussed, that it would be done. I found it difficult to keep off the technical side myself. Many points have been brought out in the discussion, and I wish especially to thank Dr. Prime for his emphasis on the importance of operative dentistry. I feel the subject has been so well covered there is no need of further treating it, and I thank you for listening to the paper and for the part you have had in its consideration.

A SIMPLE SYSTEM OF ATTACHMENT SUPPORTS FOR REMOVABLE BRIDGE WORK AND ITS APPLICATION TO BOTH VITAL AND PULPLESS TEETH.

By Forry R. Rohrer Getz, A. B., A. M., D. D. S., New York City, N. Y.

(Read before the National Dental Association at Its Twenty-first Annual Session, New York City, N. Y., October 23-26, 1917.)

IN ACCEPTING an invitation to prepare a subject for this meeting of the National Society, I did so with some reluctance, feeling that just at this time it would have been possible to do more perhaps along another line, and in doing my bit I do not intend to inflict a lengthy paper upon my hearers nor to consume more time than will be needed to present very briefly one or two facts in connection with the attachments of appliances in the practice of removable bridge work.

I have not used the word *crown* because in this instance all that I have to say applies solely to bridges and to partial or bridge plates that may be supported by and attached to natural teeth that may be either vital or pulpless.

Of all dental restorative work that comes within general practice there is no one branch that is more exacting or that makes more demands upon the ingenuity and general resources and the good judgment of the dentist, than that part which consists of restoring lost teeth with artificial substitutes, that will serve functionally, be comfortable, sightly and durable in service.

There is evident in the profession an ever growing interest in bridge work and a desire on the part of more men to give better service to those patients unfortunate enough to need artificial restorations.

It seems to me there is a distinct improvement in the mental attitude of the profession generally to bridge work in a desire to give better service in that branch and wherever restorations of a prosthetic character are needed. It must come of course just as surely as the profession advances because as there are no means by which you can insure your patient against the loss of teeth by natural processes and causes, as well as by accidents, so you must be prepared to make good the loss in a manner that keeps pace with the progress of an advancing standard.

One feature of this general advancement will be the more careful study of the effect of the forces that become active and a factor in the life of a tooth, when an artificial appliance is attached to it, and one of the very first considerations is the method or means by which an appliance can be so attached without too radically changing the natural state of a healthy tooth.

The question as to whether removal of the pulp lessens the usefulness of a tooth or shortens the period of its life in the jaw, has not been decided and probably never will be to the complete conviction and satisfaction of all. One reason for this is that the minds of men naturally differ upon the same subjects and another is that real experience changes men's minds on relative values and essentials.

Personally, I know that the extirpation of a pulp has brought relief, com-

fort, restoration of function and service in not only one but in hundreds of instances and in some cases where there appeared to be no reasons for its removal at all, so far as the external appearance of an apparently sound tooth afforded any evidence.

Experience, and the rule of reason and good judgment must be used by all. It is utterly impossible to form a hard and fast rule because of the very variability of conditions and circumstances in such a three cornered affair as dentist, patient and tissues.

Something over twelve years of experience in general practice and crown and bridge work has, I hope, enabled me to look at the matter reasonably. I have a great deal of respect for a vital and healthy tooth in a normal mouth and I prefer to keep it vital if there is any means by which a removable, sanitary and sightly bridge that is also efficient can be attached without pulp extirpation; but I do not hesitate to extirpate if that is the only thing that stands in the way of a comfortable and serviceable restoration or is the means of preventing possible future degenerative changes and the destructive effects of an abscess.

In approaching these cases of the most varied combinations of conditions, one must do so as well with a view to the satisfaction of the patients. Their views vary as to the relative values of appearances and serviceability and the means, but they are practically unanimous in wishing comfort first, and then they are pretty evenly divided between those wishing extreme strength and durability and those desiring artistic rather than utilitarian results. Most have a more or less definite idea of what they want, some of what they need, but there are very few who present themselves without reserve on the question of cutting good teeth. They have a natural antipathy of course to cutting, drilling and grinding because of the physical pain and discomfort involved, but they have also a reasonable and justifiable disinclination at first to leave all to the good intentions, but to them, unproven abilities of the dentist. This attitude really amounts to a fear that he will do something in his preparatory work which will involve destruction of natural tooth substance, enamel, dentin or pulp so that it will operate to their own disadvantage. I do not want to be understood as believing that the stand of the patient or the operator is in every instance well taken, but it is quite natural and beyond the will of the patient and the ability of the operator one cannot go.

Right there however, is where many a man makes a mistake, he is too willing to accept the attitude and protest of the patient as correct, rather than to hold a correct attitude professionally himself by stating the facts and differing, if necessary, upon what constitutes conservation, and warning his patients of the possibilities that sooner or later develop into realities of greater loss and disadvantage than if the case had been handled in a more thoro and complete manner at first by whatever plan or system was most suited to it.

Consider for a moment a type of case that is seen very frequently—a first, second or third molar, elongated or partially extruded, thru the early loss of its opponent in the opposite jaw; a condition occurring more frequently in the upper arch.

These elongated teeth are often a fourth, a third or even a half of their enamel length below the plane of occlusion of the opposite teeth, and interfere, even to locking the lower jaw in its lateral excursion, so that the patient is restricted to an up and down movement in chewing. How many bridges have you seen built to conform to these teeth that are out of plane? I cite this only as an illustration of what is and what is not good practice, to avoid extirpation.

All of us feel about the same respecting our teeth, even tho we are able to have and can enlist the services of the modern expert bridge worker. We do

not care to have enamel and dentin cut away unless there is a measurable gain to follow. Tooth tissue is about the only tissue in the body which nature do s not replace with new growths.

In view of the facts just stated we are morally and professionally bound to do no more devitalizing and no more cutting than is absolutely necessary to give good service.

Fortunately there are a number of systems, or means of attaching bridges and bridge plates or extension saddles to pulpless teeth, any one of which or their combinations will serve in almost any conservative plan, but there is only one type that I have found satisfactory for both vital and pulpless teeth.

Not all of the desirable features can receive equal consideration. To construct attachments with a view to artistic effect and lightness only is at the expense of strength, durability and long service. To lay too much stress upon strength means unsightliness, weight and discomfort.

All such considerations in the case where vital teeth are involved lead back to the same question—is it best to extirpate the pulp? That problem is made easier if it is made particular instead of general—is it better to devitalize not *a* tooth but *that* tooth? The age of the patient, and conditions of the mouth generally, as well as the will of the patient must be the deciding factors, in connection with your experience.

Too much conservatism in laying out a comprehensive plan at the start may make necessary a complete reorganization at a later date involving the casting aside of work already done. From my point of view and I think also from the patient's, this is an undesirable situation and can be avoided only by a far sighted policy and thoroness in the beginning.

With conditions favorable in size, in length and direction of roots, there is no attachment that is equal to the telescopic crown and the tube and split pin of Peeso's system. It does require, however, a larger percentage of extirpations if abutment teeth are not already pulpless, and the highest order of ability in dental work to construct it. In middle aged or older patients where degenerative changes of the pulp have in many cases already taken place and there is no particular objection to extirpation except its difficulties, I much prefer to use Dr. Peeso's system of tubes and pins.

In cases where the conditions are not such as to indicate pulp removal as the wiser course and where also the wishes of the patient must be considered, some other plan is called for, and of the various ones which I have tried, each of which serves admirably in particular cases, there are none that have given as much general satisfaction as the very simple system of the clasp and lug. It is both strong and adaptable and like the Peeso system each set of attachments must be made for their particular place. It can be applied to vital as well as to pulpless teeth, and furthermore, while its construction and application is exacting, it does not require the same high order of constructive genius as the tube and pin system, especially fitting in the mouth.

As the construction of the flat clasp is or should be comparatively simple, no more need be said than that it should not be wider than is necessary for strength.

For the sake of brevity in describing the construction of wire clasps I will quote from a paper read before the Union meeting of the Fifth, Sixth, Seventh and Eighth District Dental Societies, at Syracuse, November 25th, 1915, and printed in the Dental Cosmos for May, 1916.

Making Wire Clasps.

"The clasps made of half-round clasp wire, 12, 13, or 14 gauge, being stiffer and stronger than the corresponding weight of metal in flat clasps, are best suited for teeth that are short and that have only a narrow space between the

prominent point of the enamel contour and the gum margin. They may also be used in places where the extreme movement of the free ends of the clasps is not very great, as they slide over the abutment in removing and replacing the appliance.

In making them, the position is outlined on the working model with a pencil, as in the case of the flat clasp, and the clasps are then shaped by bending, allowing for any undercut that may exist because of the inclination of the tooth on the side of the abutment next to the space.

Frequent annealing is important, and must be done after each bending where the curves are short. Every move must be positive; bending back and forth for corrections weakens the wire, and makes a subsequent break certain. For bending, I use the following pliers, most of which are made by the S. S. White Dental Mfg. Co.: (1) Clasp bending pliers No. 134. (2) Peeso collar pliers No. 118. (3) Robinson's collar pliers No. 120. (4) S. S. W. pin-roughening pliers No. 127. (5) Goslee's contouring pliers No. 136. (6) Bernard parallel jaw pliers, side-cutting 5½ inch. (7) Bernard parallel jaw pliers 4½ inch. (8) J. G. Lane's pliers No. 119. These will be found to meet every requirement. The Bernard pliers will be found best for making bends edgewise.

The clasps are fitted closely to the model and then opened slightly for ease of removal in the succeeding steps, and are attached to the matrices."

I have been frequently asked whether a clasp will not wear the enamel of a tooth; it will, if not held firmly in position. That was the feature objected to in the older forms of clasps and the idea still persists in the minds of those who do not know the difference.

In the older forms of clasps made years ago, and in some that I have seen in new work recently, there were either, no lugs at all or very small and inadequate ones. A lug is absolutely essential to the success of a clasp attachment and any bridge or appliance fitted without one will be a doubtful success.

After trying various methods I have devised a system of making lugs that fit accurately, may be made of any size or shape to suit conditions, and are strong.

It is understood of course, in the use of clasps and lugs as in the use of the tubes and pins, that their construction must be and is individual and special work. There are no parts purchasable, at least none that are satisfactory. The advantage is that the principle is adaptable in a very large variety of conditions and the disadvantage is that it requires time, as in all specialized work.

There is no essential difference between lugs made and used on vital teeth and those made to be used on pulpless teeth, except that for the latter the inlays and lug rests may be made slightly larger and deeper and therefore the lugs somewhat stronger. This is desirable, because the lug takes most of the stress that is thrown upon the appliance.

Of the several principles that I have devised and used from time to time and the larger number of forms of each, there is one, the platinum matrix lug that I use more often than any other.

It may be made to fit directly upon the enamel of the perfectly sound tooth, without the pin if there is sufficient space between the occlusal surfaces, or it may be made to fit an inlay or a foil gold filling in a vital tooth if they are prepared with lug rests. It may in fact be made to fit any surface and any cavity, that you can prepare in any filling, inlay or crown if there is no undercut. It may be dove-tailed if desired.

Technic for Platinum Matrix.

The constructive technic of the matrix by the indirect method of inlay making is simple and as follows:

A lug to rest upon the enamel and in the sulci of a molar, or bicuspid tooth is made by first obtaining an accurate

impression of the surfaces in Detroit Modelling Compound, which comes in sticks for such purposes. An alloy die is then made as hard and dry of mercury as possible, and left over night to harden. A piece of pure platinum .003" thick is burnished and swaged over and into the surfaces and sometimes stiffened with a little pure gold. It is made a little larger for ease in handling than the finished inlay is intended to be. If a tear or hole is made while swaging, it should be covered with a small piece of the same metal and soldered with pure gold so that in subsequent soldering the lower fusing metals will not run thru.

TECHNIC OF MATRIX FOR LUG IN INLAY.

A die is made of the tooth cavity and the inlay constructed as usual, with, drills, burs and plug finishing burs of special shapes, the lug rest is prepared in any desired form, the die and inlay inserted in a swaging cup, and the platinum matrix, fitted, burnished and swaged into the inlay as in the other case. These inlay fillings that serve for lug rests also may be made for vital cuspids as well as for bicuspids and molars.

After the matrices are made they are laid aside and the inlays cemented. Before taking an impression for the working model, the under side of the matrices are waxed and they are then placed in position and pressed into place with a hot instrument. They ordinarily come out with the impression, if they do not they are carefully taken off without distorting them and replaced carefully in their places in the impression after it is set up. A model is made, dried and hardened with the matrices in the same correct relative positions as in the mouth.

TECHNIC OF PIN LUG MATRIX.

To make a lug that will not slip or pull out of its correct position in the tooth and that also will not push the tooth out of position, particularly in small bicuspids, a small iridio-platinum pin may be added which effectually locks the lug from sliding backward and also helps to reduce the lateral strain on the abutment tooth.

The matrix is made as in the case of the plain lug, then a small hole is drilled thru it into the inlay with a twist drill, No. 56, 57, 58, 59 or 60, a piece of the hard platinum wire fitted thru it, waxed and soldered. This, however, can be used mostly only in non-vital teeth.

The clasps either of flat sheet metal or half round wire are made and joined to the matrix so as to make the complete attachment and forming the lug at the same time.

They are fitted to the saddle on the model only approximately and then in the mouth, where they are waxed in correct position and soldered. From this point on the work is comparatively simple.

As I wished to present this subject from a generally conservative standpoint only, and to give a little of the basic technic, I could not go into the details of some of the other advantages which a well made close fitting lug and clasp attachment possess.

I have a few slides with which I hope to give you a better idea of the technic.

DISCUSSION.

F. E. Roach, Chicago, Ill.

I agree most heartily with most of what Dr. Getz has said. In the main, I can endorse most of what is contained in the paper. I was much pleased to note the conservative attitude of the essayist, for the reason that for a good many years I have leaned towards conservatism in this work. There was never a time in the history of the profession when we as prosthetists have been called upon to deliver a better class of work and to be more conservative in the construction of this work. The time has come when we cannot indiscriminately mutilate and destroy the natural teeth. We must be eclectic, in our practice, as well as conservative. Those are the two words that should be our motto, eclecticism and

conservitism, in the practice of removable partial artificial dentures. As a matter of fact, I would apply that same motto to the construction of all types of partial artificial dentures. After the teeth are all out of the mouth you can make a plate of almost any type and not do any material damage, but today in the light of the knowledge we have of the possibilities of foci of infection that may result from the injudicious and indiscriminate destruction of the natural teeth, it makes us hesitate before we ruthlessly destroy pulps and mutilate natural teeth, and for that reason I was especially pleased with the conservative attitude taken by the essayist with reference to this class of work. For a great many years and, as a matter of fact, for almost my entire career in dentistry, I have been a conservative. There is a place for this radical type of work no doubt. I have the greatest and the most profound respect and esteem for the class of work that has been done by our good friend, Dr. Peeso. He is a master in this work, and this class of work is doing service. It will do service for years if it is done as Dr. Peeso does it and as he teaches it should be done; but the careless and injudicious placement of this class of work in the hands of the operator that does not take the time to master the technic may result in a great deal of damage, so that my word today is this; if you are going to undertake these complicated procedures, prepare to do it as these masters of this class of work intend that it should be done, so that you will not make any serious mistake. These radical procedures call for the destruction, the removal of pulps, and the elimination or the eradication in many cases of the entire crown of a tooth, and they require great care and the best and clearest understanding of this work in order that we may not do a great deal of damage. For that reason I offer at this time a word of warning to the inexperienced who may be inclined to do this class of work.

Dr. Getz has referred to the use of the clasp as a conservative procedure. We have been using clasps ever since practically the advent of dentistry. It is one of the oldest types of means of retaining partial artificial dentures, and strange to say, today it is the most abused plan of supplying partial artificial dentures. It is one of the most universal means of anchoring partial dentures, and it should be the most extensively used means of anchoring partial dentures, and for that reason it should be better understood than any other system of anchoring partial dentures, but strange to say, as I have said, the least understood and the most abused system. If you have taken the pains to study these conditions as possibly I have done more than some of you, if you will only go into the laboratories in the cities and study the impressions that come to these laboratories from the profession generally, with the request to make a partial artificial denture, you will be surprised. Beeswax impressions, beeswax combinations of bites are taken and sent to the laboratories with the request for a partial removable artificial denture of some kind. Is it any wonder that we are receiving the bitterest condemnation of this work? Is it any wonder these appliances are the means of destruction of the natural teeth and their surrounding tissues? The wonder is that they do not do more destruction than they do. The clasp, to my mind, is an attachment that can be used and should be used in the great majority of cases. As I have already said, there are many instances where these complicated pieces of work are possible or no doubt indicated and may be used to great advantage, but the great mass of these cases, gentlemen, are cases that do not call for this class of work, and we had better spend our time and put forth our efforts in the mastery of the simple forms of clasps that we can use in anchoring these appliances.

It would be impractical for me at this time to go into the details of technic of

these various appliances. There are so many types of clasps and so many types of attachments and so many systems that we may use in this work, that it would be entirely out of place to undertake to discuss these things in detail. A large book might be written on this subject in order to do it justice, so that my message, and you will please accept it as such, is that you each individually think and consider this subject more seriously. Of course, I do not believe the men who are coming to these meetings as a whole are the men that do this work indiscriminately, but you know as well as I do that this type of work has not been given the attention it should receive.

There are a few principles I want to refer to in regard to the needs in this particular field. In the first place, we have been in the habit of looking upon these cases that come to us as requiring either a fixed bridge or the common ordinary partial plate. That is the way the great majority of cases are met regardless of what you may think about it. That is the way the majority of them are made today—fixed bridges and ordinary partial plates, so that we must learn to discriminate between the cases that require fixed bridges, the cases that require partial plates, and the cases that require more elaborate and extensive pieces of construction with a minimum destruction of the natural teeth.

As to the various kinds of attachments, almost all of them may be used under their indications.

As to the type of clasps, as a general proposition, when it comes to the employment of a clasp, I believe the best results will be obtained by using some type of wire clasp such as the essayist has indicated. In addition to the lug and accuracy of construction that has been referred to in the paper, I would suggest that you study the conditions, study the anatomical form of the teeth, and see if you cannot make these clasps by a definite step by step procedure in a way that you will get a more efficient tenso friction as our good friend Wilson calls it than we can do under the old simple forms of clasps that we have been using in the past. A clasp that grips a tooth in the mouth mesiodistally rather than labio—or bucco—lingually will be a decidedly more efficient clasp. That has been one trouble with the clasp as a means of retaining the appliance in the mouth, in that we have attempted to grip the tooth bucco-lingually or labio-lingually rather than mesio-distally. The natural form of the teeth does not make possible the maximum grip by attaching it in that way. The objection I would raise, if I saw fit to make any objection or criticism of the clasps referred to by the essayist, is the fact that he does not take advantage of this very great added feature of gripping the tooth. I hope that those of you who are interested in this subject will hear the paper by Dr. Dittmar on Thursday and Friday, in which he will show you the clasp of this type, the clasp I refer to. I have been using these clasps personally for a number of years, and I do know that their efficiency is very materially greater than the ordinary type of clasp, as was indicated by the essayist in those short teeth that he is attempting to clasp, even tho he used wire of a narrow type, which is the proper type for clasping the natural teeth. If you will remember he had the wire very close to the gum. As he stated, he had to place the clasp close to the gum in order to get below the greatest diameter of the tooth in order to get any grip at all. If he had gone over and got his gripping surface mesio-distally, he would have gotten that without the necessity of encroaching upon the peridental membrane or the gum tissue or getting on the thin part of the enamel. I do not believe personally that there is any material damage that will come to a tooth from a properly constructed clasp, particularly of the narrow wire type. I do not place any importance upon the wear of a clasp in the mouth, if it is properly made and properly fitted to the tooth

with a retaining lug. That is one of the principal reasons for the failure of the clasp, namely, we have not fitted the clasp as it should be fitted and provided for a definite and positive retention of the clasp in its position. In a short time they do not fit the teeth at all, and for that reason do not serve the purpose for which they were intended.

As I have said, this is a very important subject; I am full of it, but realize that there are others who are going to discuss it. Let us take into account the seriousness of the situation, and we as crown and bridge workers or prosthetists must make good. The eyes of the world are upon us. We have to supply these teeth that the other men are condemning, and there are thousands of people today we must supply substitutes for these missing teeth. Let us try to do it in an eclectic and conservative way. I thank you.

W. D. Tracy, New York City.

I believe with Dr. Getz that the problems confronting us as practical dentists which deal with the restoration of lost dental organs are among the most important and among the most perplexing with which we have to deal.

It is true that the minds of the profession have for some time been focusing on these problems and we do not have to seek very far to learn the reason for this fact.

Because of our recent findings concerning the relation of diseased teeth to the health, many more teeth are being removed at the present time than heretofore, and rightly so. This more radical removal of all classes of teeth, but particularly of the bicuspids and molars, has naturally stimulated an interest and an ingenuity in devising ways and means of replacing these lost organs.

Again, our understanding concerning the relations of general oral cleanliness to the health of the individual has brought the profession to the point where extensive pieces of fixed bridge work must necessarily be looked upon with disfavor.

To meet the demand for something to take the place of the old type of fixed bridge work many expedients have been adopted some of great merit and many of but little virtue.

One hears much nowadays about the desirability of standardizing procedures in dental practice and no sane-minded man would deny that along certain lines and in certain departments of our work standardization is most desirable, and in many cases quite possible. But from my own point of view, it is quite impossible to lay down hard and fast rules for the standardization of procedure in the restoration of lost teeth and in the reconstruction of mutilated mouths.

Some of the reasons why I feel that this is so are, that conditions vary to such an extent in different cases that the hard and fast rule applied to case A might be absolutely impracticable in case B; that one patient might be in a position to have the most ideal thing, with all that it involves in the way of extensive detail, done by way of restoration, while another patient presenting similar conditions might be absolutely unable to proceed along the same lines, yet the dentist must care for the second case.

Another factor in dealing with the restoration of mutilated cases is the eternal personal equation of the dentist himself. While Dr. Smith and Dr. Jones may both be men of standing and achievement, and who gain good results for their patients in the ultimate, it is quite likely that the latter would obtain better results using his own engineering and his own methods, than if he were obliged to use the engineering and methods of the former, even tho the former may persistently maintain that his method is the only real way to do it.

Results are what count gentlemen and we all know that Dr. Getz obtains results for his patients that are way above the average. His standing in the profession has been gained on the strength

of these results and that is why you have asked him to prepare this paper.

To enter into any discussion concerning the devitalization of pulps might lead us far afield but I wish to say that when desired results can be attained without devitalization of teeth with normal pulps I prefer to maintain them in a state of vitality. There was a time when I felt no hesitation concerning the extirpation of pulps, but I confess that time has passed.

However, I feel very much as your essayist does concerning this point, namely, that if the best ultimate result can only be obtained by devitalization then that operation must be performed with the full courage of the operator's convictions in the most scientific manner possible.

The tenor of the essayist's remarks concerning his consideration of the patient's desires in the kind of work they wish to have done or the manner in which they wish to have it done, might possibly mislead some of his hearers. Knowing him as I do, however, I feel sure that he means that the dentist should bend to the desires of the patient only so far as is compatible with the success of the work which is being undertaken and therefore with their own best interests.

Omitting several interesting and important points brought out in the paper we come to the consideration of removable pieces depending for their retention, upon clasps, and combination clasp and lug attachments. The possibilities in this field are practically without limitation and in many instances prosthetic pieces made along these lines seem to be absolutely the best thing that can be made, all circumstances considered.

The term clasp may mean many different things, but the essential features in a satisfactory clasp are, that it shall embrace the tooth in a manner that will retain the piece successfully with the least possible risk to the integrity of the tooth, and with the least possible conspicuosity when used near the front of the mouth.

Dr. Getz speaks of half round wire clasps and of flat clasps, but I have been very much interested and greatly pleased with the results gained in making clasps by the casting process, and in passing, I must pay my respects to my friend, Dr. Nesbitt, who blazed the trail, for me at least, and for many others, I am sure, in this special clasp construction.

Granting that clasps, and clasp lug combinations are essential in making many of our prosthetic restorations I am almost prepared to say to you that cast clasps can be universally applied. In other words, that one can make in wax, any type of clasp desired; half round, flat, concave, or loop clasp and cast it in Ney's special alloy gold and obtain better results than could be gained by bending and fitting with pliers.

Many times where one of the teeth to be clasped is also to receive an inlay, the inlay is cast with a very definite box-like lug socket in it. The inlay is placed in the cavity and when the impression is taken, it is removed in the impression and thus becomes a part of your working model which under these circumstances is best made with artificial stone.

With this model prepared having the inlay or inlays in their proper positions, the clasp and lug are made in wax and cast all in one piece with a resulting fit and adaption that would be difficult to obtain by any other method.

All the suggestions made by our essayist, such as the dovetailed lug or the lug with short pin engaging a hold in an inlay or filling, can be carried out in the application of the cast clasp and sometimes these devices are very helpful to prevent teeth from drifting.

I have passed many important points in the paper, including elongated teeth, needless sacrifice of tooth structure, the Peeso method of bridge construction, etc., because I wanted to use some of the few moments allotted to me, to speak of the clasps made by the casting process

and trust those who have not yet done so, will look into the subject.

I am grateful to Dr. Getz and to the Committee for permitting me an opportunity to discuss this timely and interesting paper.

Norman B. Nesbett, Boston, Mass.

It is with a distinct feeling of pleasure that I have prepared a short discussion of Dr. Getz's most excellent paper. First, because the paper is written by a man who not only writes things but who does those things with his hands and brain in full coordination.

Second, because while the essayist owns up to something over twelve years of experience in this line of endeavor, the men who know me best know that it has been a hobby of mine for over eighteen years, and how eagerly I welcome any light that is shed on this all-important subject.

There is little doubt that the age of conservative dentistry has arrived, and that in the future the operators who would do removable bridge work will be obliged to perfect themselves in this simple class of work, or else find themselves as hopelessly outclassed as are the operators who stick exclusively to the rapidly growing obsolete form of fixed bridge work, done by the shell crown method.

It is refreshing to note the growing interest displayed by our profession in the removable type of work. It is also rather pathetic to note their endeavors and failures, owing to lack of training, along these lines. For it is a fact, with the exception of the men trained in the Peeso system, that very little adequate instruction is to be had in this clasp type of work. I consider our essayist altogether too modest when he states that the construction of the flat lug clasp is, or should be, comparatively simple. My observations have led me to believe that very few operators know how to construct a good clasp, with a properly proportioned and fitting lug or stop. And conversely when an operator is found, who can take a piece of 24 gauge high fusing clasp metal and make a one piece clasp and lug, said clasp to be properly contoured and not weakened at any point by needless bending, that operator is competent to construct any type of removable bridge work that has ever been devised. For he has the training in his fingers, the brains to direct those fingers, and the judgment to know what kind of bridge to select for the given case at hand.

A clasp without a lug always reminds me of a wooden leg without a foot—it lacks support—and the essayist's stand on this matter is none too positive. We may have our different methods of making that lug, but make it, and make it strong we must, or our work will fail.

I am sorry that Dr. Getz did not place some emphasis on the special care this type of work should receive in the hands of the patients. When I first became interested in this form of attachment, I was rather discouraged by the claims of many of our profession that "clasps ruined all teeth." Undoubtedly such clasps as they made did ruin nearly all teeth on which they were placed. But a clasp properly made, placed in the right position on the proper tooth, and the patient given adequate instruction as to the care of same, I have not found the destruction of the enamel surfaces such as was predicted. Might we, at the close of the discussion, hear a few words on this point from Dr. Getz on this disadvantage of this system? I might say in passing that I have been wearing one of this type of bridges for nearly five years and still have some enamel left on the abutment teeth.

I realize that an essayist and his audience gain very little from a discusser who agrees on nearly every point in his paper, but a perusal of this essay prior to this session found me in accord with the paper as a whole and in part, and I am convinced that as the years go on, and his skill and resourcefulness in-

creases, Dr. Getz will devitalize even fewer teeth than he now does. I wish to thank him for the privilege of reading his paper, and again express my pleasure in taking part in the discussion.

Forry R. Getz: I want to say, lest I be misunderstood, that I claim no credit whatever for the idea of the clasp as a retentive attachment. I stated in a former paper that it belonged to Dr. Bonwill. What I have done in my own work is to devise and use a system of lugs that are wholly adequate to the stress that they are intended to withstand; and developed a system of making each one of these individually. In the older work that I have seen, and with very few exceptions in the newer and more recent forms, the lugs were neither of good shapes, well-fitting nor very strong.

Dr. Roach brought up the question of grip, as to whether it is not better in a meso-distal than in a labio-buccal direction. He is correct in that. There is one point in that connection, however, that will bear mention, and that is this: everyone of you who have had experience with the bell-shaped crown, know how utterly impossible it is to make the ends of a clasp fit around these teeth that form a large V shaped space with the adjoining teeth and the gum. I spoke of that in connection with the half round wire and the flat clasp. The latter has much freer movement than the wire clasp and in certain cases it is more adaptable, but it is more difficult to adapt to short bell-shaped teeth on account of getting in a good curve.

The half round wire clasp can be bent to get this curve and the mesio-distal hold that Dr. Roach spoke of. I think you will remember having seen two or three cases on the model and screen where the clasp comes down just below the most prominent part of the buccal surface and then turns upward still keeping in contact with the curve of the most prominent surface mesially.

THE TEACHING OF ANESTHESIA AND ANESTHETICS.

By Herbert A. Potts, M. D., D. D. S., F. A. C. S., Chicago.

(Read before American Institute of Dental Teachers, Pittsburgh.)

IN PRESENTING this paper for your thought and discussion I should like to first draw your attention to the subject in a general way and divide it into two parts, namely:

1. General Anesthetics and Anesthesia.
2. Local Anesthetics and Anesthesia.

In the teaching of anesthesia we must consider that the majority of operations in and about the mouth can be better and more safely done under a local anesthetic than under a general one and that it is logical that we spend more time in an effort to turn out finished local anesthetists, rather than general anesthetists. However, one should not deprecate the importance of a knowledge of general anesthesia, because it is required by State Boards, and second that the dentist, even tho he does not administer a general anesthetic to his patient when such is needed, should be familiar with the important points of its administration.

In the practice of dentistry, the chief general anesthetic and the one in most common use is nitrous-oxide in combination with oxygen-gas, therefore we should endeavor to specialize, if I may use the term, in teaching this anesthetic.

A general comprehension of general anesthesia is very desirable, but I question in a measure whether we are properly safeguarding the public in leading the students to believe that after they have graduated from our schools they are competent to induce general anesthesia even tho they have the legal right. The general hospitals of the country have pointed a way, in that the majority of them have their own resident anesthetists. This will be required under the proposed standardization of hospitals which will soon be undertaken.

The medical student, when he has graduated and passed his State Board, is legally qualified to practice medicine and administer general anesthetics. In former years the anesthetics in our general hospitals were administered by the newly graduated internes. It was the lack of uniformity in results obtained at their hands, the unfavorable sequels, and fatalities at times, which led to the employment of trained anesthetics. The dental graduate is in practically the same position, and even tho he has the legal right, I doubt very much if he has the moral right to really learn the art of inducing anesthesia by practicing, untutored upon his own patients. It seems to me that he might better perfect himself in the art of local anesthesia which will be of far more use to him. Then if he desires to enter the broader field and administer general anesthetics he should take a special course under the direct tutelage of a professional anesthetist and there are now numerous courses open for him. If we are to teach the student to give general anesthetics he should be taught by didactic lectures covering the subject as it is presented in various text-

books, but of more importance is the actual administration of the anesthetic directly under the supervision of a trained anesthetist. There are many methods given in text-books, but if one is to familiarize the student with the subject in the space of time allotted, the most widely employed, simplest and safest methods must be taught, this I think is the open method, which implies proper thickness of gauze over a simple mask and a continuous dropping of ether. By this method fewer accidents occur, fewer complications arise during administration and fewer post-anesthetic troubles follow.

For the administration of nitrous-oxid oxygen we have many excellent mechanical devices; it requires more skill to maintain a perfect continuous anesthesia by means of these drugs than any other, and repeated administrations directly under the supervision of a professional is necessary for one to master the art.

The chief reason for a wide experience under a professional anesthetist is that practically no two people will take an anesthetic in the same way and in no one case will all possible complications arise, and in order to be master of the situation at all times, it is necessary that one actually witness these various complications, and the oldest in experience has yet some new complication to meet. Consequently in the administration of the few cases which occur during the college course, one will have fallen far short of being familiar with what might be termed normal anesthesia, to say nothing of these cases in which complications arise.

Improvement in technic and popularity of local anesthesia are greatly reducing the number of general anesthetics administered in dental colleges and also in general hospitals. Consequently the opportunity for the study of general anesthesia has been greatly curtailed.

There is a vast difference between the knowledge required to pass an examination and that required to anesthetize a patient with the minimum amount of danger and discomfort, the latter requiring an adequate experience, plus the same amount of knowledge. I would rather take my chances with a nurse who had been properly coached over a period of months, in giving, we will say, 500 anesthetics, than with an intern who had the didactic training but no experience in the practical application of it.

One must realize that anesthesia is a science which requires special study and that an anesthetist should be a specialist, the highest type of which is one who after years of experience, both in theory and practice, not only of his own specialty, but of kindred subjects, rounds out his own subject with a course of study and practice. And I doubt if one has the right, morally at least, to practice such a specialty without having had adequate preparation.

The comparative safety of gas has led the dentist to use it with impunity. The false assurance has also been engendered by some manufacturers who in exploiting their wares have urged the unskilled to use these rapidly acting drugs as a mechanic would use an engine of power on an inanimate object.

The student should be impressed with the fact that the more rapidly the drug acts the more easily may it get his control also the drugs which depress the vital organs are to be used only when it is impossible to use safer ones. The rule should be—always use the safest drug but in an emergency use the safest at hand.

Some of the conclusions of the most familiar with the action and administration of anesthetics are, viz:

1. Nitrous-oxide and oxygen: Safest but more difficult to administer continuously than the other. Less acidosis or fatty changes follow its use. Opsonic index lowered to a less degree. Difficult or impossible to obtain relaxation. When operating in mouth or face, may be impossible to keep patient under and we

must use the next safest. It does not contribute to ventricular fibrillation.

2. Ether:—Causes some destruction of red blood corpuscles. Reduces opsonic index, this remains low for five or six days and is largely responsible for post-operative pneumonia. Causes more fatty changes in parenchymatous organs than nitrous-oxide but less than chloroform. Does not contribute to ventricular fibrillation. Can be given by means of the drop method, vapor forced into pharynx, trachea or by means of an emulsion in olive oil per rectum.

3. Chloroform: Dangerous because it lowers blood pressure, causes dilation of heart and blood vessels. Lessens contractility of muscles. Causes ventricular fibrillation which has probably been the cause of death in nine-tenths of the fatal cases from its use. I might add that Levy has especially pointed out the danger of administration of adrenalin when chloroform has been given as ventricular fibrillation is precipitated by it, suggesting that the struggling stage and consequent muscular contraction squeezes the adrenal secretion into the circulation with resulting heart failure. It causes fatty changes, especially late changes.

With these facts before us it seems that with possibly the exception of nitrous-oxide we should not give our students the false sense of security by inadequately teaching them to administer anesthetics when the number of administrations is so meagre as it is in our schools. The student upon the bench sees the patient brought in, sees the dropping of ether upon the mask, hears a strange sound, and sees the anesthetist carry the patient's jaw forward, he notices the disappearance of the sound, then the operation begins, but little does he know what is passing thru the anesthetist's mind regarding blood pressure, color, rate and rhythm of pulse, depth and rate of respiration, mucous or blood in throat or trachea, reflexes, depth of anesthesia and many other possible conditions which at any time may mean life or death of the patient.

Furthermore, the student never will learn these things except by "having his own fingers in it," actually by giving many anesthetics under the guidance of one of experience, and this experience only can be had in a special course which he can take until he has mastered it.

With nitrous-oxide it is possible for the student to get a great deal of experience in the art of its administration as there are many extractions to be done in the extracting clinic, but of late the importance of teaching the induction of local anesthesia, which I think is of more real use to the student, has in a measure crowded out the nitrous-oxide.

Time was when "Painless Dentistry" was the stock in trade of the quack but today it can be made to be all that the name implies. I do not advocate or teach that the preparation of cavities should be rendered painless as they can be by infiltration or nerve-blocking but in a few selected cases it may be practical.

With the exception of children the majority of operations within and about the mouth can be better, more conveniently, and more safely done under local than under general anesthesia. If this be true why not spend more time and energy in teaching local anesthesia, as you know it needs a lot of teaching and demonstration and then the student rarely more than half succeeds but he is in a position to study and improve his technic and finally master it.

This can be taught at the chair in the clinic, to the extracting clinic and in the oral surgery. It should include study and recitation from text-books and clinical experiments under a teacher who will take the student thru the various steps of preparation of solutions, and instruments, impress asepsis from start to finish, preparation of field of operation, kind of needle, short bevel toward the bone, injection submucous of subperios-

tial, nerve blocking or a combination of any or all of them, pressure and waiting a sufficient time before operating, etc., etc.

This should be begun in the Junior year by lectures and recitations, by study and demonstrations upon skulls and wet specimens. It should be shown that the anesthetic must thoroly infiltrate the tissues to be operated upon if infiltration is to be practiced and if nerve blocking is employed the anesthetic must be deposited around a nerve trunk. This implies a knowledge of not only gross anatomy and location of nerve trunks, but minute anatomy, because bony tissue can not be infiltrated except thru the natural minute foraminae thru which course the blood vessels and the counter pressure must be supplied by the periosteum, necessitating the introduction of the needle beneath it and slow steady expulsion from the syringe. All this and much more can be shown on specimens, projected by means of the stereopticon or projectoscope, utilizing the cuts from text-books. Clinical demonstrations should be continuous in the extracting room and oral surgery, thru both junior and senior years.

THE DENTAL CLINIC IN THE FACTORY.

By William R. DeField, Dental Department of Montgomery Ward & Co., Chicago, Illinois.

(Read before the National Dental Association at Its Twenty-first Annual Session, New York City, N. Y., October 23-26, 1917.)

THE dental department works independently, but cooperates with the medical division. Before installing a dental office to serve our employees, we corresponded with various corporations who were already operating a similar plan, and received the benefit of their experiences. In one important respect, we disregarded the advice of every concern with whom we communicated. Invariably they advised us to confine our dental work to caring for emergencies, making examinations, giving advice for the care of the teeth, and referring patients to outside dentists for further work.

We feel that the prices asked by good dentists tend to prevent many people from exerting timely care of their teeth—while the low-priced quacks do a great deal of harm. An office doing only emergency work and examinations could not remedy these drawbacks. Our office is therefore equipped not only for free emergency work and preliminary examinations, but to give the very best of all kinds of dental service. The charge for fillings, crowns or any other work is simply the cost of materials and the dentist's time, all work being done on the company's time without loss of wages to the employee.

We started with a two chair office, but before long this had to be enlarged to five chairs to care for the people applying for service. Emergency cases are cared for at once; others desiring attention notify the office, are placed on a waiting list, and are called in their turns. An estimate of the cost is given upon the examination; and for any work done, arrangements are made for weekly payments, if the employee so desires. Our Kansas City store keeps one dentist busy on the same plan.

This department is presumably self-supporting; as a matter of fact, it has never paid for itself; but we feel that health results more than make up for its extra cost.

No work is done for families of employees, and no one is asked to have his work done in the company's office. If the employee has his own dentist, we invariably advise him to have his work done there, rather than at our office.

The examination of teeth and oral conditions, relief of emergency cases of tooth-ache, and all advice and instruction along Oral Hygiene lines is given free of charge. This latter instruction is considered a very important part of our work, and the personal talk to the employee is what we find gets the results. I might emphasize here that we spend a great deal of time trying to educate the employees regarding the detrimental practices of the dental quack, as a large percentage appear to have patronized these charlatans of the dental profession.

One of the features of dental education is the posting of bulletins on Oral Hygiene, and the importance of the care of the teeth, etc. Oral Hygiene articles are also frequently inserted in a

small newspaper published frequently by the House.

In all of the work, the aim is to co-operate with the medical department, whenever and wherever it is possible, in diagnosing and treatment, and the cause of many cases of continued temperature, rheumatism, neuralgia, etc., has been traced to the teeth.

Employees in dire need of dental services, whose financial condition is such as to prohibit the smallest payment, if found to be worthy by the Welfare Department, are given the required service gratis.

An article by Dr. Earle H. Thomas, the head of our Dental Department, describing in detail the dental service at the Chicago plant of Montgomery Ward & Co., appeared in the "Dental Review" for May, 1917, and I will quote from that:

"Every phase of health and its relation to a clear brain and efficient service is of vital importance to large, progressive industrial corporations in these modern days when "efficiency" is the watchword. Therefore we find, as medical departments of most of them, well-equipped hospitals, with physicians and nurses in constant attendance, resulting in the improvement in health and happiness, and consequent efficiency of our people.

The phase of health that is of especial prominence at present, is the relationship of septic and neglected teeth and mouths to general systemic diseases, and, in view of this, it is not surprising that special consideration be now given to good dentistry by many large corporations thru their welfare, educational or efficiency departments, with the resultant installation of dental departments. Of course, this is a step toward greater efficiency, but humanitarian principles play no small part in its conception and execution.

Many corporations during the last few years have secured the services of dentists whose work was limited to the relief of toothache, the teaching of oral hygiene, and the examination of the teeth with advice to secure the services of an outside dentist—some corporations even going so far as to make this compulsory. Montgomery Ward & Co., however, were among the first of the larger corporations (they employ around 6,000 in their Chicago plant) to enter into this phase of welfare work on a large scale, with the broader policy of doing for their employees actual reparative dentistry in all its branches except orthodontia. They had no precedent to follow, and so worked out their plans as they went along, trying first one and then another, the peculiarities of dental service under such circumstances taxing the ingenuity of both dental and efficiency departments, until now experience has materialized into a set routine of practical procedure.

It seems that the main objection voiced by most corporations against actual dental work for their employees, is the fear of continual malpractice litigation thru the bad influence of quack lawyers who keep in constant touch with all opportunities for creating trouble around a plant of this kind. Montgomery Ward & Co., however, decided to risk all this trouble and expense in order to benefit their employees, and altho the dental department has been in existence for almost two years, and has taken care of over 3,000 patients, not one suit of malpractice has come up and the employees are practically unanimous in their expressions of praise and good will toward the dental department and its beneficent services.

Another objection to the installation of this kind of service was the perplexing question of the charge for services rendered. To give all classes of the dental service free, would be too paternalistic, and every welfare worker in a large corporation knows that tact in keeping this attitude from the minds of employees needing welfare service is very essential. Free dental service would also have a tendency to suggest to the mind of the

average employee that the work done would not be of the best. On the other hand, to charge for the work would have a tendency to suggest to the employee's mind that the company was trying to make money on the venture.

Montgomery Ward & Co. overcame both of these difficulties and objections by offering free dental examinations, advice and relief of emergency cases, and making a charge for only actual reparative work emphasizing in every possible manner, however, that this charge was the actual cost of the service rendered—in fact, below cost, as no overhead, rent, heat or light expense is charged against the dental office, only the dentists' time and material used.

Nothing in connection with the office is compulsory yet. It has built itself up thru merit and good service from one chair to five chairs, with the actual need and likelihood in the near future of another chair.

The dental office is equipped with a Ritter white enamel equipment, consisting of five chairs.

The office force consists of six dentists, four working full days and two working half days, and one dental nurse. The dentists are employed on straight salary, it being thought inadvisable to place them on a percentage basis, as that might lead to hasty and imperfect work.

The office is open from 8 o'clock A. M. to 5 o'clock P. M. One dentist spends practically all of his time examining teeth, relieving emergency cases and giving individual instruction along oral hygiene lines. The salary of the dental nurse, the overhead expense, heat, light and rent are charged to welfare. The salaries of the dentists plus the material used is the sole basis of reckoning charges against patients having actual reparative work done. Thus, you see that the work is given to the employee below actual cost.

All work is done on the company's time, during working hours, and the employees are paid for their time while in the dental office. The average time of each visit of an employee to the dental office is three-quarters of an hour, altho there are no restrictions—we may keep him as long as is necessary.

There is a private automatic telephone system in building, and all of our patients are called to the dental office on the telephone about fifteen minutes before they are wanted, thus giving ample time for arranging the handling of their work while away and also plenty of time to get to the dental office. No definite appointments are made with any one unless it is one who is hard to reach by means of the telephone.

When an employee has a toothache, his division manager calls up our office, and notifies us. We usually have the time-keeper (there is one in each division) send the employee to our division at once, unless we are very busy, in which case we aim to call him inside of fifteen minutes. At the time of treating the toothache, if it is necessary, the patient is given a sufficiently long educational talk on oral hygiene, the condition of his mouth and its relation to health. We are invariably then asked to place his name on the waiting list for a thoro examination of his mouth, and if he would like us to do the work, an estimate, based on cost, to be given. We are then usually able to persuade him to have his whole mouth put in good healthy condition. Our emergencies average fifteen per day, and in this manner we reach a number who are not educated along dental lines and who would not think of going to an outside dentist except to get a tooth extracted, and sometimes not even then. In fact, if we are to be of any help to the efficiency of the employees, these are just the people we must reach, as the others will keep their mouths in good condition without our advice.

Even tho the patient intends to have the work done by an outside dentist, careful examination, recommendations and advice are given, and all with the

aim of cooperating with—not antagonizing outside dentists. In fact, we are often of assistance to him in looking after conditions that possibly could not go safely the length of time between visits of the patient to his office.

Patients with very septic mouths who, after examination, say they are going to have the work done outside, are called back to the office a short time later to see if they are having their teeth attended to, and if not, they are given a little stimulation by means of a straight-from-the-shoulder talk.

Medical examination is compulsory, and all new employees are required to pass this, or they will not be employed. When the medical examiner finds distinct evidence of a septic mouth, he refers the employee to the dental office, and his medical examination will not be O. K.'d until he is passed by the dentist. In all of our work, we aim to co-operate with the medical department, whenever it is possible in diagnosis and treatment, and the cause of many cases of continued temperature, rheumatism and neuralgia has been traced to the teeth."

A. H. Stevenson, New York City.

I would add that the whole crux of the situation and the reason this session under the Oral Hygiene Committee's control, is because our efforts to enlighten the public in oral hygiene have had a peculiar effect. We have brought to their attention the need of dental care, and then these labor people have gone to dentists in their communities,—men whom they thought were capable of taking care of their mouths—who had alluring signs—and it has proved in some cases a curse rather than a blessing. In one of our clinics there were shown four or five bottles containing bridge work placed in the mouths of these poor people, who had paid enormous amounts for them, and for health reasons had to have them removed. We know all professions have that type of practitioner, and in the neighborhood where these people live unfortunately this type of practitioner exists and flourishes.

Industrial employees should receive just as good dental attention as anyone else. We have long recognized that they should receive good medical attention and if they cannot afford to pay for proper dental service it is certainly up to the industrial corporations to see that they get it under industrial corporation control.

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The Research Department

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THE RESEARCH INSTITUTE OF
THE NATIONAL DENTAL ASSOCIATION
CLEVELAND, OHIO

WESTON A. PRICE, M. S., D. D. S.,
President

SAMUEL E. POND, B. H., A. M., *Acting Research Director*

ELECTROLYTIC MEDICATION.

(Physiological and Dental Aspects.)

By Samuel E. Pond and Weston A. Price.

(From the Laboratories of the Research Institute of the National Dental Association, Cleveland, Ohio.)

(Concluded from June issue.)

SUMMARY.

In the light of the evidence which is at hand regarding direct electro-chemical action, at the present we may summarize as follows:

(1) The action of the current is such as to direct ions in one mean path, to bring about a separation of the cations and anions from the solution to the cathode and anode respectively, as uncharged molecules. In consequence of the directive effect, there is an increased diffusion of the oppositely charged particles, in opposite directions. Hence, water may be transported in one direction (electro-endosmos) and suspended *charged* particles in the same or the opposite direction (cataphoresis). In consequence of the separation of the ions to the electrodes, so long as the current flows, ions must be given off from the electrodes, tending to maintain an equilibrium. Hence, e. g. zinc and copper electrodes would dissolve, when positive ions were precipitated out of the solution. As soon as the supply of ions in the solutions is exhausted the current flow would cease. We have also seen that the electric current does not "ionize" the electrolytes in the solution—i. e. does not cause the splitting up of zinc chloride ($ZnCl_2$ into Zn^{++} and $2Cl^{-}$). The action of the electric current is mainly such as to disturb an equilibrium tending to exist between the ions going out of solution, i. e. given up to the electrodes and the ions going into solution from the electrodes.

(2) The introduction between the electrodes of such a partition as a tooth, clay or porcelain wall, a cell membrane, or a mass of tissue may not wholly inter-

fere with the passage of the current but may oppose the passage of the ions. The current is carried by anions, and cations; and the ions may penetrate or be bound at the partitions. In the former case the ions pass thru the pores with their charges. Where the ions do not penetrate the partitions they may be presumed to be held upon one side, balanced by oppositely charged ions on the other side. In the case of relatively larger pores like the apical foramen the negatively charged partition would be lined by cations and only anions could penetrate. In small pores the anions would not penetrate because of the negatively charged wall.

(3) With an electrode in the root canal nearly to the foramen (not thru it) the greater portion of the current in most cases passes thru the wall of the root. In such a condition evolution of gas takes place, partially blocking the foramen to the current and thus throwing the conduction of the current largely upon the wall. To pass thru the foramen, some electrodes are not satisfactory if the aperture is smaller than 0.008″ in diameter. Zinc, however, is not sufficiently ductile to be readily made into such electrodes. If, however, the electrode is passed thru the foramen another factor is introduced, the formation of gas. The effect of hydrogen, oxygen and chlorin (those most commonly met with) as confined in the periapical region, have not been studied carefully. Our investigations in this connection are not complete and no conclusions would be warranted.

(4) It does not, then, seem probable that the supposed penetration of ions *to the infected periapical tissues* has uniformly been effected in practice with the electrolytes used. Much more careful clinical and other laboratory data must be advanced to determine whether specific ions will penetrate and disinfect periapical tissues under definite conditions.

Conclusions.

It will be seen from this discussion that generally the problems are not simple, and, to have comparable data, considerable careful experimental work must be done and actual conditions of experimental work must be known. It is further important to turn our attention to physiological, as well as physical and chemical, aspects of such problems.

We have presented considerable evidence upon two main questions—(1) the direct action of electrolytes, electric current and electro-chemical products upon bacteria, and, (2) whether the current reaches the involved tissues. As pointed out in the discussion, it has been assumed by those using "Electrolytic Medication" (a) that electrolytes or ions (b) that electric current and (c) that the electrolytically precipitated elements killed bacteria. We have (using the electrolytes recommended by practitioners) found no evidence to support such a position. It seems that there is no such *direct* action leading to disinfection under present practice. We further conclude that the energy utilized in Electrolytic Medication has not been expended where the profession has believed; i. e., rather than upon the pathological tissues about the apex, it has been expended largely upon the normal pericemental tissues about the lateral root walls. If there is a beneficial action or disinfection it must be indirect, possibly by creating a radical change in the body tissues and then followed by cytolysis of the bacteria. We have recognized that some such fundamental or indirect action might take place. It is possible that the electric current may act to change some of the body or tissue functions. We recognize, also, that the transformation of a living to a dying cell may possibly be brought about by fundamental chemical or electrical changes. Upon these questions there is little evidence and the collection of data will probably, for the present, be a difficult matter. Light upon

this aspect of our problem may be reflected as the result of further research. Experimental work upon this and further questions regarding electrolytic medication will be continued. A study of the indirect action thru electrolytic medication will be undertaken later, at which time it is expected the question of stimulation, regeneration of body tissues and the production of hyperemia, or phagocytosis and the attendant effects, will be carefully examined.

The authors believe that it may be possible to perfect an electro-chemical method as an efficient agent for the sterilization of tooth and supporting tissues. There is a probability, based largely on theoretical grounds, that other ions than those in use can be utilized as disinfecting agents. Intensive research may bring these to light. Extension of the present study, it is hoped, will contribute to the knowledge of disinfection of deep tissues by electro-chemical means.

Bibliography.

(In connection with the investigation of the problem of Electrolytic Medication the following bibliography was compiled. The list includes the literature of an historical value as well as the sources for scientific information. Most of the material is directly related to the subject but there are a number of articles which are related only when the fundamental principles of Electrolytic Medication are taken into consideration. Articles, books, and reprints are arranged alphabetically by authors. Some entries have been grouped under subject heading, viz: Bibliography, History, Journals and these groups inserted alphabetically according to the title.

It will be appreciated if errors in, and additions to, this list will be brought to the attention of the Research Institute.)

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OTTO U. KING, D. D. S., 127 N. Dearborn St., Chicago, Illinois.
Associate Editors,
THOMAS P. HINMAN, D. D. S., Atlanta, Ga.
HARVEY J. BURKHART, D. D. S., Rochester, N. Y.
THOMAS B. HARTZELL, D. M. D., M. D., Minneapolis, Minn.

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Editorial Department.

NEW LEGISLATION FOR NAVAL DENTAL CORPS.

Congress has recently enacted new legislation for the Naval Dental Corps, the full provisions of which we publish on page 877. But a brief resume may assist those interested in readily determining the changes resulting therefrom.

First: All laws relating to the Medical and Dental Reserve Corps were repealed with a proviso that such Reserve officers may be transferred to the Naval Reserve Force. This harmonizes with other Reserve officers of the Navy.

Second: Applicants passing the required examination are immediately commissioned in the Naval Dental Corps as Lieutenants (Junior Grade) which corresponds to First Lieutenant in the Army, instead of serving a two-year probationary period as heretofore required. All pro-

bationary officers now in service immediately become eligible for permanent appointment.

Third: Officers in the Naval Dental Corps are eligible for advancement in grade and rank in the same manner under like conditions as officers in the Naval Medical Corps up to the rank of Lieutenant Commander, which corresponds to Major in the Army.

Fourth: A specific percentage of Dental Officers become eligible for advancement in pay and allowances of Commander and Captain, but are not granted rank. (Commander and Captain in the Navy correspond respectfully to Lieutenant Colonel and Colonel in the Army.)

Fifth: Approximately fifteen members of the Naval Dental Corps will be eligible to immediate promotion to the grade of Lieutenant Commander. This number in this grade is not limited, while under the provisions of the legislation of August 29, 1916, the number in this grade was limited to eight and such promotion was only reached after twenty years' service.

Sixth: Unfortunately, this is not as satisfactory legislation as that enacted October 6, 1917, for the Army Dental Corps, which placed this Corps on an equal status with the Medical Corps of the Army, which in part was due to the fact that the Navy Dental Corps had only six years service from date of original organization, while the Army had fifteen years to its credit. Also, it must be understood that in the Navy the administrative features relating to duty on board ship and in Hospitals is of a much closer personal nature than in the Army, thus more liable to complications owing to rank, which was a prominent feature of the Departments opposition. However, one very important advantage was obtained, something not accorded to any other Corps in the service, and that was dating back to original appointment of the rank and precedence of the original members of the corps, who had served in the acting grades. At this time, this was of more importance than the obtaining of the rank of commander and captain, a matter the future will take care of by the time this rank would be confronted in due course. With the obtaining of organizational grades and rank, in the same Act, provision was made whereby the dental officers of the Reserve Force are eligible to promotion up to and including the rank of lieutenant commander under like conditions as obtained by the Act of October 6, 1917, for the Army Reserve officers.

Thus it will be seen, that for all practicable purposes of the present, the profession's interests as well as that of all the dental officers in the service of the Navy have been well taken care of and in a satisfactory manner and upon an exact equality with the Medical Corps of the Navy, (Regular and Reserve) to and including the rank of lieutenant commander.

Army and Navy

LAW ENFORCEMENT.

Attorneys Instructed to Enforce Law Against Prostitution.

To All United States Attorneys:

I am deeply interested in the successful enforcement of Section 13 of the Selective Service Act and the regulations thereunder, and desire to give all assistance within the power of this department to the protection of the military and naval forces of the United States from the evil results of prostitution and promiscuous sexual intercourse around camps. The object of said section and regulations is the suppression of this evil and no pains should be spared by the members of the department of justice toward suppression.

The Surgeon General of the army, however, has called my attention to the fact that persons charged with violations of said section and regulations, especially prostitutes, are, in the majority of cases, carriers of venereal disease. These persons, even tho prosecuted and convicted, eventually regain their freedom. I am informed that many of them return to the practice of prostitution and, unless cured of their diseases before release, infect a large number of soldiers and sailors before they are again caught violating the law. I feel that it is the duty of this department to do all within its power to minimize the dangerous effects arising from this situation.

Surgeon General's Campaign.

The Surgeon General's office of the war department is engaged in an aggressive and organized campaign against the spread and for the cure of venereal diseases; and as prostitution is a prolific source of these diseases, this campaign includes both the suppression of prostitution, and the medical examination, quarantine and cure of prostitutes afflicted with such diseases. As the local public health authorities generally have the legal powers requisite for such examination, quarantine and cure, the Surgeon General's office is working in co-operation with local health authorities and endeavors to galvanize the activities of those health departments, state and local, which have been lax in such matters.

You are, therefore, instructed in the cases of all persons arrested under the foregoing section and regulations to arrange for the immediate reporting of all such persons to the local or state health authorities, in order that these authorities may have opportunity, under local health laws, to cause medical examinations of such persons to be made and to enforce such health laws, regulations, or ordinances relative to quarantine, treatment and other disease control measures. Pending the examination, isolation and treatment by the health authorities, the prosecution should be suspended, to be resumed when the health authorities discharge the defendant from the hospital or other institu-

tion to which she may have been sent by them.

If the local health laws, regulations or ordinances are inadequate, or if the local health authorities fail or refuse to act promptly when a case is presented to them, then you should bring the case to trial at the earliest possible date, and if it results in conviction or a plea of guilty, ask the court for a brief delay of sentence, and, between the date of conviction and the date of sentence, arrange for a medical examination of the defendant. If such medical examination discloses the existence of an infectious venereal disease, you will present a written report of such fact to the court, to be considered by the court, in connection with all of the facts of the case, in determining the sentence to be imposed.

Compulsory Notification.

In all cases where medical examination, either under local laws or as above provided for, reveals the existence of venereal disease, you are directed to urge the commitment of the persons so diseased, wherever possible, to reformatory or penal institutions equipped with facilities for proper medical treatment during the period of imprisonment. In every such case, the authorities in charge of such institution should be notified in writing of the physical condition of the convicted person and directed to afford all proper treatment. Such authorities should be further requested, before the termination of the period of imprisonment, to notify the local health authorities of the then physical condition of the prisoner, in order that such quarantine or supervision may be instituted, under state or local laws, as may be necessary for the protection of the public health.

You are further advised that the Surgeon General of the army has instructed his representatives in the Sanitary Corps, now detailed to extra-cantonment areas thruout the United States, to co-operate with you in carrying out this program.

Where you find that the local health officials fail or refuse to proceed as above outlined, you are requested to make immediate report of all of the facts to the Surgeon General of the army at Washington, D. C., for his information.

There is sent to you herewith a memorandum relating to the legal aspects of the procedure above outlined.

Respectfully,

T. W. GREGORY,
Attorney General.

NAVY MEDICAL PROMOTIONS.

In accordance with the increase of the permanent authorized enlisted strength of the Navy to 131,485, the naval medical corps will be allowed a number of additional officers, including two medical directors with the rank of captain, and forty medical inspectors. with the rank of commander. The vacancies in these grades will be filled by selection, upon recommendation of the board of high-ranking medical officers yet to be appointed, and promotions in the lower grades will be with running mates in the line, as provided by law. The medical corps has had an allowance of 843 officers, and under the new law the allowance will be 1,120. The promotions now in prospect will be temporary, so far as numbers allowed the higher grades are based on the officers temporarily filling up the total allowance of the corps, and permanent promotions can be made only as permanent appointments are made in the corps.

NAVY MEDICAL SUPPLIES.

The surgeon general of the Navy is purchasing medical, hospital, and dental supplies estimated to cost $2,825,000. The schedule is intended to cover the needs of the bureau of medicine and surgery for the next fiscal year. It is necessary to meet the exceptional demands imposed by war at home and abroad, on shore and at sea, including new supply

depots at Brest and Liverpool. It is, however, neither desirable nor economical to contract for all of these supplies at one time, since the needs of the year cannot be definitely estimated, and, in order to secure the best results, these supplies must be procured from time to time thruout the year. On the recommendation of Surgeon General Braisted, authority has been granted to procure these supplies after competition but without newspaper advertisement. It will be possible, therefore, to place contracts as they are needed among firms who are selected to enter the competition for the orders, it having been found that newspaper advertising for bids has induced competition from undesirable bidders and secured supplies of an inferior quality. Even the most rigid inspection is an insufficient guarantee of the purity and quality of many drugs, the therapeutic value of which can only be determined by their physiological action. The method of purchase is the same that has been satisfactorily followed during a number of years, has passed the careful scrutiny of the accounting officers of the treasury without a single criticism or objection, and has received the departmental approval.—*Army and Navy Register, July 6.*

NAVY APPROPRIATION BILL.

The conference report was considered in the House on Tuesday and Wednesday. The House approved of the action taken by the House conferees with regard to the Senate amendments agreed to. There was considerable debate relative to the amendments reserved for a separate vote by the House. It was decided to send practically all the Senate amendments back to conference, the House instructing its conferees to insist on their disagreement thereto. The House agreed to accept the following amendments: No. 4, relative to patents; No. 33, relative to increase of the permanent enlisted strength of the Navy from 87,000 to 131,485, and No. 75, establishing a Navy nitrate plant.

There was considerable objection voiced against the amendment providing legislation for the dental corps of the Navy. Representative Oliver, a member of the naval committee, stated that the matter had not been considered by the committee and there had been no hearings upon it. He expressed the opinion that in such matters of legislation, where the necessity for it seemed apparent, there should be hearings and consideration of the proposed changes by the House Committee before the matter was submitted to the House for a vote. Representatives Good and Snook insisted that the matter should be considered at once, the former calling attention to the fact that such a bill had been pending before the naval committee for some time.

Representative Stafford told the House that the amendment did not originate with the Secretary of the Navy and did not have his endorsement. He charged that the amendment was the result of influence used to seek increase in rank and pay of officers. He said: "It does not in any way increase the number of dental surgeons that are needed in the service, because it merely provides one for every thousand, but seeks to increase the pay and rank of all in the service. That is something, I contend, we should guard against in these times when we need the money for other purposes. It is the tendency now in every quarter for officers, wherever they can do so, to endeavor to increase their pay. We have indirectly increased the pay of these dental officers by providing commutation of quarters, and yet they come in here and in a wholesale fashion wish to get an increase of pay and rank by reason of war condition, not to continue merely during the war, but for all time. * * * But there is too much tendency now on the part of the Navy to endeavor to parallel every increase that is found in the

Army. It merely means an increase of the pay of the dental surgeons now in the Navy, and I do not think that practice should be approved of, and I do not think this House is in favor of that policy."—*Army and Navy Register, June 22.*

1918 CLASS ELIGIBLE FOR HOSPITAL DENTAL INTERNES.

Washington, D. C., June 22, 1918

Enlisted dentists of 1918 class who have enlisted in enlisted Reserve Corps of Medical Department are eligible for selection as hospital full time dental internes for one year before active military service. Internship must begin before November. Such hospitals as desire such dental internes should communicate with Lieutenant Colonel Arnold this office giving name of dental internes desired. Statement Colonel Logan.

SURGEON GENERAL GORGAS.

SUPPLY OF CIVILIAN DOCTORS.

Already the scarcity of doctors is beginning to be felt in some communities, particularly in smaller towns, where the best physicians have joined the military service. Examinations are being held continuously to fill vacancies in the Army medical reserve corps, and medical officers have thus far been obtained in sufficient number to meet current requirements. With the vast increase in the National Army, there will be, of course, an increasing demand for medical officers; and it is to be expected, also, that with the greater participation of the American forces in the fighting zones there will be additional demands for the services of physicians and surgeons. The needs of civil life however, will not be neglected, and arrangements have been made thru the council of national defense to distribute practicing physicians so as to provide communities with doctors where they are needed. The staffs of civil hospitals and the faculties of medical schools must not be depleted, and these requirements have also been given consideration. There are many thousands of practicing physicians scattered thruout the country who earnestly desire to join the colors, but who have remained at home because of their obligation to the civil population. They are performing a truly heroic duty, not spectacular, but none the less patriotic.—*Army and Navy Register, June 29.*

GIRL SCOUTS AS MESSENGERS.

An innovation is in operation at the surgeon general's office of the Army. In order to reduce the demand for manstrength, the army medical department is employing girl scouts as messengers and these khaiki-garbed misses are busily engaged in scurrying about the vast building on Seventh street, carrying papers and bearing messages, as well as guiding the puzzled stranger about the department. The plan gives general satisfaction. The girls are holding temporary appointments, and presumably most of them will return to school in the fall.—*Army and Navy Register, July 6.*

BEFORE THEY GO TO CAMP.

What the doctor should say at a farewell instruction meeting of drafted men is suggested by Dr. Guy L. Noyes, chairman of the Public Health Committee, Missouri Council of Defense.

Dr. Noyes would have them give clear, straight instruction on matters of personal hygiene in general, and the man's obligation to report to the commanding officer at once if he has lately been exposed to an infectious disease—typhoid, small pox, etc. If the occasion is propitious and he has the subject well in hand, the doctor should discuss briefly but frankly illicit sexual intercourse, and the effects, direct and indirect, of venereal diseases. Among the points to be

made in such a discussion, Dr. Noyes includes the following:

Venereal disease will discredit a man in the army and cause him to be classed with and to work with undesirable jobs. It will also cause him to forfeit his pay.

Venereal Disease will not cause him to be discharged from the Army.

That all excesses, alcoholic, sexual and dietetic, will delay his normal healthy adjustment to camp life and hinder just this much his chance for prompt advancement.

That the National Army is not a "rough neck" organization and that decency of thought, speech, and action are rewarded in the army of today as they are in civil life.—*The Social Hygiene Bulletin.*

ARMY MEDICAL CORPS PROMOTIONS.

The final scheme for promotion in the Army medical corps is embodied in a Senate amendment to the Army appropriation bill in which it is provided that there shall be promotion in the permanent corps and also in the National Army thus dividing the different branches of the medical establishment. The regular corps gets an assistant surgeon general, with the rank of major general, and three assistant surgeons general, with the rank of brigadier general, who are to be appointed from the medical corps of the Regular Army. The president is authorized to appoint in the medical department of the National Army not to exceed four major generals and eight brigadier generals for each 1,000,000 officers and enlisted men of the entire National Army. Other commissioned officers of the regular corps from the grade of colonel down are to be proportionately distributed in the several grades as provided by law. Those in the medical reserve corps are to be proportionately distributed as provided by law for the medical corps of the Navy. It is anticipated that promotion in the regular corps will be at a normal rate during the war; and the commissioned personnel will not become too large for the eventual military force to be maintained in this country after the war. The increased rank for reserve officers is intended as a slight measure of recognition of the services of distinguished surgeons and physicians in aiding the government during the present emergency.—*Army and Navy Register, June 29.*

ARMY MEDICAL SCHOOL GRADUATES.

A class, consisting of 51 members, was graduated last week from the army medical school in Washington. The graduating members will be recommended in a few days for commissions as first lieutenants in the medical corps of the regular army. They will be required to serve but about one year before attaining the grade of captain.—*Army and Navy Register, June 29.*

WILL NOT DISTURB DR. GRADY.

A special provision in the naval appropriation bill is to the effect that "the senior dental officer now at the United States Naval Academy shall not be displaced by the provisions of this act, and he shall hereafter have the grade of dental surgeon and the rank, pay, and allowances of lieutenant commander, and he shall not be eligible for retirement before he has reached the age of 70 years except for physical disability incurred in the line of duty."

Surgeon General Braisted made the following statement concerning this legislation: "That legislation is in favor of Dr. Grady, who has always been the dental surgeon at the Naval Academy, and Dr. Grady thinks that he should have the same rank that the corresponding dental officer has at West Point. He has been long in the service, and this was put in specially for him, and they intended to have it stand as dental surgeon."—*Army and Navy Register, June 29.*

TRAVELERS WITHIN THE DRAFT AGE.

The United States Government is seeking information concerning men of draft age who are travelers in foreign countries. It is proposed by the Department of Justice to get in touch with such men whenever possible, and their cases will be brought before federal grand juries. Men who have sought refuge within countries which are our allies in this war will be brought back, but those in neutral countries will probably escape extradition. However, they will be compelled to remain in such countries or take the consequences of prosecution by this Government if they enter an allied country or return to this country after the war. The Department of Justice invites the assistance of the public in obtaining proof of violations of this character and asks that statements of fact, preferably in writing and signed, should be as definite and full as possible concerning each case.—*Army and Navy Register, June 29.*

THE ARMY MAKES REAL MEN.

(From the New York Telegraph.)

Our text for a few remarks on service in the American army is taken from a letter written by a boy in France to his mother He said: "I am twice as strong as when I came away and I am developing fine. I weigh 170 pounds and am taller than ever. This life agrees with me." Thus it is with the young men in the Army; they think it is fine to be made over into tall, strong men, of good weight and development. Note the cheerful tone of the writer—"this life agrees with me." Further on in the letter the youth says, "You will be proud of me when I return." The mother already is proud as she possibly can be of this strong and gallant young optimist.

Army life is making the young men of the country into a new race; it transforms them. They have regular hours, they have plenty of food of the right sort; they refrain from liquor and they get the required number of hours of sleep and of exercise. Small wonder it is that when going into combat they advance with a smile and hurl themselves on the Hun with such fury and strength that the enemy cannot resist them.

After the war is fought and won a great army of citizens should be maintained. We have found out what military drill does for men. Keep it up. —*Army and Navy Register, June 29.*

ELIGIBLE FOR COMMISSION UNDER RESTRICTED CONDITIONS.

The Secretary of War has ruled that men born in an alien enemy country or in any country alien hereto, who emigrated to the United States prior to five years of age and who are of approved loyalty and a United States citizen either thru their own or thru their parents' naturalization, will be deemed eligible for commission in the Army. This, of course, includes commissions for the Medical Reserve Corps.

REGARDING SERVING OF LIQUOR TO SOLDIERS.

It is announced that new regulations have been made relative to serving liquor to soldiers which prevent selling, bartering, giving, serving, or knowingly delivering alcoholic liquor to any officer or member of the military forces within the United States, its territories or possessions or any place under its control, except to medical officers for medical purposes.

AMERICAN DENTIST DECORATED

Dr. W. D. Carlyle, a dentist of Salem, Ore., and at present on duty with the Y. M. C. A., Russian unit in France, was recently decorated with the Order of Stanislaus for bravery in caring for wounded.

DENTAL SURGEON W. E. OSBORNE KILLED IN ACTION IN FRANCE.

The Navy Department has been advised of the death of Dental Surg. Weeden Edward Osborne, United States Navy, who was killed in action in France June 6, while attached to the marines serving with the American Expeditionary Force.

The distinguished service cross was posthumously awarded Dental Surg. Osborne by the Commander in Chief of the Expeditionary Forces with the following notation in official orders:

"Dental Surg. Weeden E. Osborne, United States Navy, during the advance on Bouresches, France, on June 6, 1918, at great risk of his life, performed heroic deeds in aiding the wounded. He was struck by a shell while carrying an officer to a place of safety."

Osborne, who had been with the marines at the front only a few days when the action at Bouresches took place, went into the zone of fire time and again to rescue wounded. He went to the aid of a wounded officer and had succeeded in carrying him almost out of the range of fire when a shell struck, killing both Osborne and the officer. In reporting his death, his commanding officer wrote:

"Having joined this regiment but a few days before, and new to the service, he displayed heroism worthy of its best traditions."

Dental Surg. Osborne was born in Chicago, November 13, 1892. On May 8, 1917, he was appointed a dental surgeon in the Navy, and served at the navy yard, Boston, from June 5, 1917, to December 13, 1917, when he was detached and assigned to duty on the Alabama. On March 30, 1918, he was ordered to report to the commanding officer of a regiment of marines, with the American Expeditionary Force in France, and was serving with this regiment at the time of his death. Next of kin, Elizabeth Osborne, sister, 4427 Racine Avenue, Chicago, Ill.—*The Official Bulletin, Wednesday, July 17, 1918.*

STUDENTS ON OVERSEAS DUTY NOT GRANTED FURLOUGH.

The Adjutant-General of the Army announces that it is the policy of the War Department not to allow the return of enlisted men from overseas to the United States for the purpose of completing their education. This policy applies to medical, dental and veterinary students.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

DENTAL CORPS.

Maj. Bruce H. Roberts from duties with base Hospital 2, Fort Bliss, to Fort Sam Houston for duty with evacuation hospital 17.

1st Lieut. Wm. J. R. Akeroyd from duties at Camp Zachary Taylor, Ky., to duty with evacuation hospital 18, that camp.

1st Lieut. Samuel J. Lewis from duties at Camp Meade, Md., to Alexandria, La., Camp Beauregard, for duty with base hospital 102.

—*Army and Navy Register, July 6.*

DENTAL RESERVE CORPS.

Maj. John Voss to Rockford, Ill., Camp Grant, for duty with base hospital 58.

—*Army and Navy Register, June 29.*

Appointment of following dental reserve corps announced: To be Captains—1st Lieuts. Howard A. Reid, Fred L. McAninch, Arthur H. Nobbs, Henry O. Lineberger, Carlton B. Leighton, Walter E. Miller, Pope L. Marshall, Francis E. Derham, Solomon J. Z. Gantz, Henry H. Braxtan, Frank H. Cushman, Albert B. Crutcher, Carl M. Holland, Emory O. West, Fielding M. Wilhite, John B. Williams, Robert M. Schell, Thomas H. Tye, George K. Patterson, Courtney J. Murphy, Alexander W. McClean, Nealie E. Ross, Robert A. Adkins, James H. Johnson, Matthew A. Boykin, Frampton W. Farmer, John H. Davis, Edward M. Atkinson, Harry B. Laird, Neal D. Williams, Wm. D. Rush, Elliott H. Rowland, Walter E. Lowrie, George G. Starke, Homer T. Kemper, John L. Remsen, Harvey B. Haselton, Max F. Gruber, Fred A. Beaty, James C. Campbell and Clarence A. Flanagan.

—*Army and Navy Register, July 6.*

Legislative Department

NAVY DENTAL CORPS LEGISLATION.

"That the Act approved August twenty-ninth, nineteen hundred and sixteen, entitled "An Act making appropriations for the naval service for the fiscal year ending June thirtieth, nineteen hundred and seventeen, and for other purposes" (Statutes at Large, volume thirty-nine, chapter four hundred and seventeen, pages five hundred and seventy-three and five hundred and seventy-four), be, and the same is hereby, amended by striking out all of said Act following the caption "Naval Dental Corps" on page five hundred and seventy-three, but preceding the caption "Dental Reserve Corps," on page five hundred and seventy-four, and by substituting therefor the following:

"That the President of the United States is hereby authorized to appoint and commission, by and with the advice and consent of the Senate, dental officers in the Navy at the rate of one for each thousand of the total authorized number of officers and enlisted men of the Navy and Marine Corps, in the grades of assistant dental surgeon, passed assistant dental surgeon, and dental surgeon, who shall constitute the Naval Dental Corps, and shall be a part of the Medical Department of the Navy. Original appointments to the Naval Dental Corps shall be made in the grade of assistant dental surgeon with the rank of lieutenant (junior grade), and all dental officers now in the Dental Corps appointed under the provisions of the Act of Congress approved August twenty-second, nineteen hundred and twelve (Statutes at Large, volume thirty-seven, page three hundred and forty-five), or under the provisions of the Act of Congress approved August twenty-ninth, nineteen hundred and sixteen (Statutes at Large, volume thirty-nine, page five hundred and seventy-three), or who may hereafter be appointed, shall take rank and precedence with officers of the Naval Medical Corps of the same rank according to the dates of their respective commissions or original appointments, and all such dental officers shall be eligible for advancement in grade and rank in the same manner and under the same conditions as officers of the Naval Medical Corps with or next after whom they take precedence, and shall receive the same pay and allowances as officers of corresponding rank and length of service in the Naval Medical Corps up to and including the rank of lieutenant commander: Provided, That dental surgeons shall be eligible for advancement in pay and allowances, but not in rank, to and including the pay and allowances of commander and captain, subject to such examinations as the Secretary of the Navy may prescribe, except that the number of dental surgeons with the pay and allowances of captain shall not exceed four and one-half per centum and the number of dental surgeons with the pay and allowances of commander shall not exceed eight per centum of the total authorized number of dental officers: Provided further, That dental surgeons shall be eligible for advancement to the pay and allowances of commander and captain when their total active service as dental officers in the Navy is such that is rendered as officers of the Naval Medical Corps, it would place them in the list of medical officers with the pay and allowances of commander or captain, as the case may be. And provided further, that dental officers who shall have gained or lost numbers on the Navy list shall be considered to have gained or lost service accordingly; and the time served by dental officers on active duty as acting

assistant dental surgeons and assistant dental surgeons under provisions of law existing prior to the passage of this Act shall be reckoned in computing the increased service pay and service for precedence and promotion of dental officers herein authorized or heretofore appointed.

"All appointees authorized by this Act shall be citizens of the United States between twenty-one and thirty-two years of age, and shall be graduates of standard medical or dental colleges and trained in the several branches of dentistry, and shall, before appointment, have successfully passed mental, moral, physical and professional examinations before medical and professional examining boards appointed by the Secretary of the Navy, and have been recommended tor appointment by such boards: Provided, that hereafter no person shall be appointed as assistant dental surgeon in the Navy who is not a graduate of a standard medical or dental college.

"Officers of the Naval Dental Corps shall become eligible for retirement in the same manner and under the same conditions as now prescribed by law for officers of the Naval Dental Corps, except that section fourteen hundred and forty-five of the Revised Statutes of the United States shall not be applicable to dental officers, and they shall not be entitled to rank above lieutenant commander on the retired list, or to retired pay above that of captain.

"All dental officers now serving under probationary appointments shall become immediately eligible for permanent appointment under the provisions of this Act, subject to the examinations prescribed by the Secretary of the Navy for original appointment as dental officers, and may be appointed assistant dental surgeon with the rank of lieutenant (junior grade) to rank from the date of their probationary appointments: Provided, that the senior dental officer now at the United States Naval Academy shall not be displaced by the provisions of this Act, and he shall hereafter have the grade of dental surgeon and the rank, pay, and allowances of lieutenant commander, and he shall not be eligible for retirement before he has reached the age of seventy years, except for physical disability incurred in the line of duty: Provided further, that no dental officer in the Navy who on original appointment as dental officer was over forty years of age shall be eligible for retirement before he has reached the age of seventy years, except for physical disability incurred in line of duty.

"All Acts or parts of Acts inconsistent with the provisions of this Act relating to the Dental Corps of the Navy are hereby repealed: Provided, that nothing herein contained shall be construed to legislate out of the service any officer now in the Medical Department of the Navy or to reduce the rank, pay, or allowances now authorized by law for any officer of the Navy."

MEDICAL CORPS LEGISLATION.

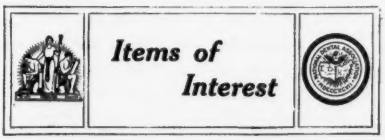
"Increase in Medical Department: That the Medical Department of the Regular Army be, and is hereby, increased by one assistant surgeon general, for service abroad during the present war, who shall have the rank of major general, and two assistant surgeon generals, who shall have the rank of brigadier general, all of whom shall be appointed from the medical Corps of the Regular Army.

"That the President may nominate and appoint in the Medical Department of the National Army, by and with the advice and consent of the Senate, from the Medical Corps of the Regular Army not to exceed two major generals and four brigadier generals."

"That the commissioned officers of the Medical Corps of the Regular Army, none of whom shall have rank above that of colonel, shall be proportionately distrib-

uted in the several grades as now provided by law."

"That the commissioned officers of the Medical Reserve Corps of the Regular Army, none of whom shall have rank above that of colonel, shall be proportionately distributed in the several grades as now provided by law for the Medical Corps of the Regular Army: Provided, That nothing in this act shall be held or construed so as to discharge any officer of the Regular Army or deprive him of a commission which he now holds therein."



C. M. CARR PATENT VOID.

United States Court Decrees Patent On Pyorrhea Tools Invalid.

Dentists everywhere will be interested in learning that certain litigation of great importance to the profession has just terminated. The result is a complete victory for the Dental Protective Association of the United States, which, in carrying out the objects of its charter, successfully assumed the defense of a case brought against one of its members.

The Carr School of Preventive Dentistry and Medicine, assignee of Cassius M. Carr, brought suit against Dr. Austin F. James, of Chicago, in the U. S. District Court for the Northern District of Illinois, Eastern Division, for alleged infringement of the Carr patent on Pyorrhea tools and for unfair competition in trade. On Tuesday, July 2, 1918, His Honor, Judge George A. Carpenter, entered a final decree adjudging as invalid, void, and of no effect in law these Letters Patent known as No. 1,138,355, issued May 4, 1915, to Cassius M. Carr, on Dental Tools, and which the patentee purports to exemplify in a set of one hundred fifty tools, well known as the Carr Pyorrhea set. The suit was ordered dismissed for want of equity at the plaintiff's costs.

The importance of the case arises from the establishment of the right of all dentists to avail themselves of instruments of the type described in the patent, in larger or smaller sets, without paying patent tribute to anyone. The Dental Protective Association of the United States conceived that the patent sued on was not a good patent in law, and that its existence could be made, and was likely to be made, the basis of serious oppression to dentists, especially in view of the numerous suits already brought under it. The suit against Dr. James was one which the Association considered to be of that character. The Dental Protective Association has consistently fought to protect its members from unjust and unlawful patent claims, and makes no distinction in this respect between patents for mechanical devices and patents for processes or methods. While its chief obligation is to its members, such results as come from its success in the present case will inure to the benefit of the profession as a whole.

A vast amount of testimony was taken by both parties to the suit, the plaintiff having thirty-six witnesses and the defendant twenty-five. For the defendant a large number of the most prominent teachers and practitioners on the subject of pyorrhea gave valuable testimony.

The defeat of the Carr patent ought to relieve many dentists from the annoyance of litigation which Carr or the Carr School has threatened to institute. The air is cleared and dentists now are justified in treating the patent as tho it did not exist.

In passing it may be mentioned that a suit brought by Carr against Dr. Thomas B. Hartzell, of Minneapolis, on the same

patent, was defended by the Dental Protective Association, and was also dismissed at Carr's costs.

The Association's attorney's are Mr. Percy B. Eckart of Chicago, general counsel, and Mr. Luther Johns, of Chicago, patent counsel. We express our appreciation of their very thoro preparation of the case and its successful defense.

(Signed)

DENTAL PROTECTIVE ASSOCIATION OF THE UNITED STATES.

By J. G. Reid, D. M. Gallie, J. P. Buckley, Directors.

TRIBUTE TO THE MEMORIAL OF G. V. BLACK.

"It is for every member of the Illinois State Dental Society to show his appreciation of these honors by attending the National meeting and doing whatever he is called upon to do.

Aside from the consideration involving our state pride; aside from the consideration that the program offerings will be compelling; aside from the consideration of the social reunion features afforded, there is a deeper motive which should prompt our presence—a motive which has its origin in the love, veneration and esteem we feel for the Father of Modern Dentistry whose memory will be honored at the time. The memorial monument to Dr. Greene Vardiman Black will be dedicated Thursday, August 8th, and the tribute of our presence in honoring this great and wonderful man should be esteemed a rare privilege by the entire profession, and with especial significance to the men of Illinois."—*Illinois Bulletin.*

HOLD YOUR LIBERTY BONDS.

(Bureau of Publicity, Treasury Department.)

To successfully finance the war it is necessary that owners of Liberty Bonds hold their bonds if possible. Where for any good reason it is necessary for them to turn their bonds into cash, they should seek the advice of their bankers.

Liberty Loan Bonds are very desirable investments and crafty individuals are using various means to secure them from owners not familiar with stock values and like matters. One method is to offer to exchange for Liberty Bonds stocks or bonds of doubtful organizations represented as returning a much higher income than the bonds.

There are various other methods used and likely to be used, some of the goldbrick variety and others less crude and probably within the limits of the law. All offers for Liberty Bonds except for money and at market value should be scrutinized carefully. The bonds are the safest investments and have nontaxable and other valuable features.

To hold your Liberty Loan Bonds, if possible, is patriotic. To consult your bankers before selling them is wise.—*Army and Navy Register, July 20.*

CONSERVE THE MUCOUS MEMBRANE.

The mechanical efficiency of the sound skin as a protective agent against the invasion of the body by micro-organisms is obvious. Little credit for a similar protection is usually accorded to the mucous membranes. It is true that the latter do not furnish the same degree of resistance or immunity which the external coverings of the skin afford. Nevertheless, it ought to be realized that many organisms can be implanted with impunity in mucous membranes, especially in those portions which are engaged in the production of mucous or which are provided with a ciliated epithelium as a safeguard. The underestimated usefulness of the mucus secreted by the membranes of the nasal cavities is more easily appreciated when the circumstances to which they are exposed are related. It has been estimated that under normal conditions of life in large cities, from

15,000, to 20,000 bacteria enter the nose in an hour's quiet respiration. Yet under normal anatomic and physiologic conditions few of these organisms ever reach the nasopharynx in a viable condition. To some extent at least the mucus secreted is responsible for this. It is reputed to have an inhibitory if not an actual bactericidal effect on germs; and a liter of mucus per day has been reported as representing the amount of available secretion. The highly specialized epithelium of the trachea and nose is further effective as a protection against unorganized dust. Perhaps if this were more universally recognized and taught, ciliated mucus-secreting membranes would be treated in a less irritating manner. How many physicians realize that when the ciliated cells are destroyed by caustics, operative procedures or disease, they are frequently replaced by squamous cells, and the efficiency of the nose as a protective organ is correspondingly impaired?—*Journal of the American Medical Association.*

Announcements

IOWA STATE BOARD OF DENTAL EXAMINERS.

The next meeting of the Iowa State Board for the examination of applicants will be held in Iowa City, commencing August 26th at 9:00 A. M.

For further information address the Secretary,

DR. J. A. WEST,
417 Utica Bldg., Des Moines, Iowa.

HARVARD AND TUFTS TRAINING SCHOOL DENTAL HYGIENISTS.

July 5, 1918.

Dear Editor:

The commencement exercises of the Harvard-Tufts Training School for Dental Hygienists were held at Hotel Thorndike, Boston, Mass., on June 21, 1918.

The program consisted of dinner and addresses by Dr. H. C. Bumpus, President of Tuft's College; Dr. George H. Wright; Dr. Wm. Rice, Dean of Tuft's College Dental School; Dr. Henry H. Piper; Dr. Leila M. Taylor, Director of the school, and Miss B. L. MacFarland, of the graduating class.

Dr. Eugene H. Smith, Dean of the Harvard Dental School, and chairman of the Administrative Board of the Training School, presided and awarded the certificates.

Yours truly,
LEILA M. TAYLOR, D. M. D.,
Director.

NORTHEASTERN DENTAL ASSOCIATION.

The 24th annual meeting of the Northeastern Dental Association will be held at the Narragansett Hotel, Providence, R. I., October 10th, 11th, 12th, 1918.

ALVIN A. HUNT, Secretary.

KOLYNOS

AS AN

ANTISEPTIC

Hunter, in his address upon "The Role of Sepsis and Antisepsis in Medicine," at Montreal in 1910, said:

"The chief seat of sepsis is in the mouth."

Again he said:

"My clinical experience satisfies me that if oral sepsis (and naso-pharyngial) could be successfully excluded, the other channels by which 'Medical Sepsis' gains entrance to the body might almost be ignored."

Much has been learned about Sepsis since 1910, but these words still remain among the Verities.

It is now generally accepted that many of the most serious cases of septic infection have been occasioned by mistaken or imperfect dental operations. It is also known that such cases can usually be correctly diagnosed, treated or prevented only by the enlightened modern dentist, however much he may be aided by consultation with the general practitioner.

During and following all such treatments, preventive or curative, Kolynos Dental Cream is the true Handmaid of the Dentist and the Patient. It was evolved to secure regularly recurring antisepsis of the teeth, the mouth and the throat by thorough cleansing and by removing masses of surface bacteria and retarding their rapid redevelopment. This it does most efficiently.

In the words of Hunter, the true principle of antisepsis is: "Removal of Sepsis wherever it is causing ill effects and can be got at."

THE KOLYNOS COMPANY

NEW HAVEN, CONN.